

Chapter Seven

RAILROAD COORDINATION

BUREAU OF DESIGN AND ENVIRONMENT MANUAL

Chapter Seven
RAILROAD COORDINATION

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Chapter Seven

RAILROAD COORDINATION

7-1 ADMINISTRATIVE FUNCTIONS

7-1.01 Selection of Projects

The *Federal Highway Safety Act* authorizes funds for the improvement of highway-railroad safety by installing or upgrading warning devices.

The available program funds are allocated as a specific dollar amount between the Bureaus of Design and Environment and Local Roads and Streets with recommendations for distribution among the various types of projects (e.g., warning devices, abandoned crossings) for each Bureau's program.

BDE allocates funds to each district according to a weighted average of a district's share of the total track-lanes of crossings in the State, modified by demonstrated need. Each district prepares a list of candidate projects and proposed types of improvement for inclusion in the upcoming year's program, based on the following criteria:

- the expected crashes (see Section 7-3.02 to determine if existing warning devices are sufficient for the expected crashes);
- crash history;
- public complaints;
- individual observations made during the annual grade crossing inspection (the credibility of the existing warning devices should be carefully checked); and
- Railroad company's request for improvements.

For additional guidance on the selection of projects, review the FHWA *Railroad-Highway Grade Crossing Handbook*. Consider the following when determining project selection:

- removal of non-complying guardrail around warning device bases; and
- removal of abandoned at-grade crossings.

Make every attempt to coordinate any proposed warning device projects on crossings of State-maintained highways where track circuitry overlaps those of adjacent local crossings. Exchange this information with the Bureau of Local Roads and Streets to coordinate the work and programming.

BDE, working with the Division of Traffic Safety, Bureau of Statewide Program Planning within the Office of Planning and Programming, and the Illinois Commerce Commission, may identify a

list of high-crash locations not included in the district's lists. BDE will convene a "Diagnostic Team" to investigate each crossing on the list. BDE will document any deficiencies discovered and solutions proposed.

The priority lists are finalized and published as the "FY 20__ Highway Safety Improvement Program." This publication becomes the official program of the Department. The selected projects are then sent to FHWA by BDE with a request for authorization as soon as the Federal funds become available. The projects are then administered as Federal-aid projects under the Project Oversight Agreement.

7-1.02 Financial Participation

7-1.02(a) Grade-Separation Improvements

The following financial arrangements will apply:

1. New Structure — Department Project. Where a new grade-separation structure will be constructed as a result of a project initiated by the Department, 100% of the cost will be borne by the Department except for the following:
 - a. Active Warning Devices. Where the principal grade crossing or crossings, at which active warning devices are in place or ordered to be installed by the Illinois Commerce Commission, will be closed after completion of the project, the Railroad will be required to bear 5% of the cost of the structure and approaches.

Where the number of traffic lanes will increase, the Railroad's share will be based on the estimated cost of the theoretical structure and approaches required to separate the grade for the existing number of traffic lanes.
 - b. Additional Track(s). Where the Railroad has no definite plan for the installation of additional future tracks within a reasonable time, the Railroad will be responsible for 100% of the increased costs due to providing space for the additional future track(s).
2. New Structure — Railroad Project. Where a new grade-separation structure will be constructed as a result of a Railroad-initiated project, the Railroad will be responsible for 100% of the cost.
3. Existing Structure — Department Project. Where an existing grade-separation structure on a State highway will be reconstructed as a result of a project initiated by the Department, 100% of the cost will be borne by the Department; however, this policy will not abrogate the covenants of any existing agreement that remains in effect containing provisions for maintenance or reconstruction of the structure.
4. Existing Structure — Railroad Project. Where an existing grade-separation structure (maintained by the Railroad) on a State highway is determined by the Department to be

unsafe due to physical damage or deterioration and must be reconstructed, the Railroad will be responsible for 100% of the estimated cost of the theoretical structure required to reconstruct the existing structure to its original design loading or 100% of the estimated cost to repair the existing structure to its original design loading.

7-1.02(b) Grade-Separation Maintenance

The Department will maintain new grade-separation structures on Department initiated construction. Any structures constructed as a Railroad initiated project will be maintained by the Railroad. In all cases, the Railroad will maintain the track, track bed, and railroad appurtenances.

When the Department is responsible for the maintenance of an existing structure, either by the terms of an agreement or by an Illinois Commerce Commission Order, maintenance of the Department initiated reconstructed structure will remain the responsibility of the Department.

When the Railroad is responsible for the maintenance of an existing structure, either by the terms of an agreement or by an Illinois Commerce Commission Order, maintenance of the reconstructed structure will remain the responsibility of the Railroad unless an exception is granted.

When it is in the best public interest, the Department may relieve a railroad of its maintenance obligations for a structure in return for a lump-sum payment based on the capitalized cost for perpetuation of the structure. This capitalized cost will be determined according to the following:

1. Service Life. For calculations, assume that no routine maintenance is performed and that each of the structural components will be replaced at the end of its service life in perpetuity. For most structures, the service life of the substructure will be assumed to be 100 years and, for the superstructure, 50 years. Calculate the costs for replacing the existing structural components at current prices.
2. Interest Rate. Determine the interest rate by calculating the average annual rate of return to the nearest 0.25% increment using the current fiscal year and the two preceding fiscal years. The annual rate of return for each fiscal year can be obtained from the State Treasurer's Office.
3. Capital Cost. The capitalized cost should be derived using the equation shown in Figure 7-1.A.

$$C = y \left[\frac{1}{(1+i)^n} \right] + x \left[\frac{1}{(1+i)^m} \right] + \left[\frac{\left(y \left[\frac{i}{(1+i)^{50} - 1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^n} \right] + \left[\frac{\left(x \left[\frac{i}{(1+i)^{100} - 1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^m} \right]$$

Where:

C	=	capitalized cost
x	=	cost of replacing substructure, in kind, at current prices
y	=	cost of replacing superstructure, in kind, at current prices
m	=	remaining life of substructure, years
n	=	remaining life of superstructure, years
100	=	service life of substructure, years
50	=	service life of superstructure, years
i	=	interest rate, decimal

$$\left[\frac{1}{(1+i)^m} \right] = \text{single payment present worth factor for } m \text{ years}$$

$$\left[\frac{1}{(1+i)^n} \right] = \text{single payment present worth factor for } n \text{ years}$$

$$\left[\frac{i}{(1+i)^{100}-1} \right] = \text{sinking fund factor for 100 years}$$

$$\left[\frac{i}{(1+i)^{50}-1} \right] = \text{sinking fund factor for 50 years}$$

$$x \left[\frac{1}{(1+i)^m} \right] = \text{present cost which expresses the cost of replacing the substructure } m \text{ years from the present}$$

$$y \left[\frac{1}{(1+i)^n} \right] = \text{present cost which expresses the cost of replacing the superstructure } n \text{ years from the present}$$

$$\left[\frac{\left(x \left[\frac{i}{(1+i)^{100}-1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^m} \right] = \text{present cost which expresses the cost of replacing the substructure at 100-year intervals in perpetuity beginning at a point in time } m \text{ years from the present}$$

$$\left[\frac{\left(y \left[\frac{i}{(1+i)^{50}-1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^n} \right] = \text{present cost which expresses the cost of replacing the superstructure at 50-year intervals in perpetuity beginning at a point in time } n \text{ years from the present}$$

CAPITAL COST DETERMINATIONS

Figure 7-1.A

* * * * *

Example 7-1.1

Given: An original highway-railroad grade structure was built in 1940. In 1963, the original superstructure was removed and replaced. Maintenance of the structure has been borne equally by the Railroad and the Department by Illinois Commerce Commission Order.

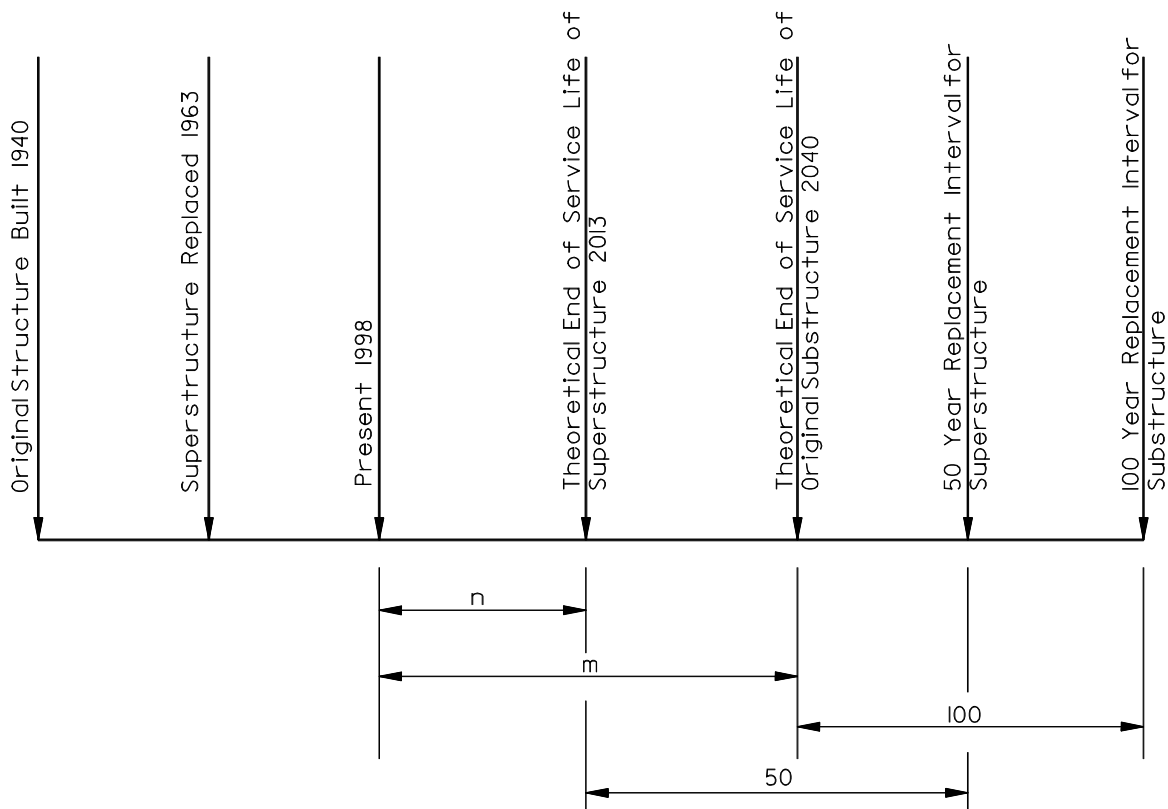
$x = \$52,003$ – Cost to replace the substructure

$y = \$56,956$ – Cost to replace superstructure

$m = 42$ years – Remaining life of substructure

$n = 15$ years – Remaining life of superstructure

$i = 6\%$ – Interest rate



Problem: A Railroad has indicated its interest in being relieved of its maintenance obligation for a highway-railroad grade-separation structure in return for a lump-sum payment to the Department in a sum equivalent to the capitalized cost for perpetuation of the structure.

Solution:

$$x \left[\frac{1}{(1+i)^m} \right] = 52,003(0.0865) = \$4498.26$$

$$y \left[\frac{1}{(1+i)^n} \right] = 56,956(0.4173) = \$23,767.74$$

$$\left[\frac{\left(x \left[\frac{i}{(1+i)^{100} - 1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^m} \right] = \left[\frac{(52,003[0.00018])}{0.06} \right] [0.0865] = \$13.49$$

$$\left[\frac{\left(y \left[\frac{i}{(1+i)^{50} - 1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^n} \right] = \left[\frac{(56,956[0.00344])}{0.06} \right] [0.4173] = \$1362.69$$

Capitalized Cost = \$29,642.18

Railroad share (50%) = 0.5 (29,642.18) = \$14,821.09

7-1.02(c) Grade Crossing Participation

The Department opposes any new at-grade crossing when such crossing involves a railroad line used for passenger train operations, regardless of the operator or frequency of the trains or the location of the crossing.

Where a new grade crossing of a freight rail line is established or an existing grade crossing will be reconstructed on a State highway as a result of a highway improvement project initiated by the Department, the Department will be responsible for 100% of the cost for constructing the crossing.

Where a new grade crossing is established or an existing grade crossing will be reconstructed on a State highway as a result of a railroad reconstruction, rehabilitation, or maintenance program initiated by the Railroad, the Railroad will be responsible for 100% of the cost of constructing or reconstructing the crossing.

When the Department determines that an existing grade crossing on a State highway is at the end of its service life and in need of reconstruction or when the Department determines that conditions warrant reconstruction, the Department may participate toward the cost of the new construction or reconstructing the crossing.

If an existing grade crossing on a State highway will be reconstructed or rehabilitated as a result of a project initiated by other than the Department or the Railroad and the Department has determined that the installation is necessary and in the best public interest, the Department may participate in the cost in proportion to the benefits to the motoring public.

Where all or any portion of the cost of new construction, reconstruction, or rehabilitation of a crossing will be provided by the Department, participation by the Department will be limited to the materials, labor, and equipment required to construct, reconstruct, or rehabilitate the crossing.

7-1.02(d) Grade Crossing and Warning Device Maintenance

The Railroad, or the track owner, is responsible for maintenance of the grade crossing and the warning devices, actuating devices, and circuitry.

7-1.02(e) Grade Crossing Warning Device Improvements

The Department requires the installation of appropriate warning signs and devices at all highway-railroad grade crossings. The Department's participation in the cost of these devices is contingent upon Department concurrence in the type of device required, the degree of sophistication necessary in the activating equipment, and the degree of contribution to highway capacity and safety.

Funding for all Department-initiated projects will be determined on a priority basis based on vehicular traffic, railroad traffic, highway classification, and the availability of funds.

The Department, the Railroad, or agencies other than the Department may propose changes in either the type of warning devices or in the method of actuation at existing crossings. Where the Department has determined that these changes will result in mutual benefits to all parties involved, the Department may participate in the costs in proportion to the benefits to the motoring public.

The Department will generally bear 100% of the cost of the improvements for the following conditions:

- Where the project includes the installation of warning devices at new grade crossings, the relocation of existing warning devices, or the installation of additional devices at existing crossings that are required as the result of highway improvement projects initiated by the Department.

- Where the Department has determined that the warning devices in place at an existing grade crossing are no longer adequate to provide for the safety of the motoring public and that additional or supplemental warning devices are deemed necessary.
- Where the Department has determined that a change is necessary in the method of actuation of automatic warning devices at existing crossings for the improvement of vehicular operations.

The Railroad will be responsible for 100% of the cost of the improvements where changes to an existing grade crossing or the construction of a new grade crossing are necessitated as the result of improvement or maintenance programs initiated by the Railroad or changes in rail operations (e.g., number of movements, speeds).

7-1.02(f) Grade Crossing Modification on a Permit Crossing

Where a railroad grade crossing has been created as the result of a permit issued by the Department, the Railroad or track owner shall take prompt action to adjust, reconstruct, or otherwise modify the crossing and/or warning devices as required by any highway improvements upon receiving a request from the Department. The Railroad or track owner will be responsible for 100% of the costs of such improvements. See *92 Illinois Administrative Code 530, Accommodation of Utilities on Right-of-Way of the Illinois State Highway System*.

7-1.03 Preliminary Engineering

7-1.03(a) General

In most instances, the Department prepares the plans for new construction, modernization, or reconstruction of highway structures, drainage facilities, and the approaches. Occasionally, the Railroad will prepare plans for a structure carrying the railroad over a highway.

All plans, specifications, and special provisions prepared by either the Department or the Railroad are subject to approval by the other party, and no changes will be allowed by either party without the consent in writing of the other party.

7-1.03(b) Reimbursement

Preliminary engineering performed by Railroad forces or by consultants employed either by the Railroad or by IDOT on highway-railroad grade separations is reimbursable with Federal or State funds.

7-1.03(c) Railroad Structures Designed By or For the Railroad

This section applies to a railroad structure over a State highway. When the Railroad elects not to perform the structure design with its own forces and the Department does not have the forces available to perform the design within the required schedule, a consultant may be employed to perform the design. Ordinarily, the Department will select a suitable consultant from a list of consultants approved by the Railroad. The design work is then performed by agreement between the Department and the consultant with the Railroad's approval.

In certain cases, where justified, the Railroad will select a consultant to design the structure and enter into an agreement with the consultant for the design. The selection of the consultant and the terms, including the fee, is subject to IDOT approval.

In those projects where Federal-aid funds are anticipated for reimbursing the Railroad's consultant for the cost of preparing the plans for a structure, the preliminary engineering cost must be programmed before IDOT can authorize the preparation of such plans.

7-1.03(d) Preliminary Engineering Portion of Railroad Force Account Work

The Railroad will generally perform the preliminary engineering with its own forces for the railroad force account work covered by construction agreements between the Department and the Railroad.

In special instances (particularly warning device system design), the Railroad may use the services of a consultant retained by the Railroad to perform the preliminary engineering.

7-1.03(e) Programming

When the method of treating a railroad crossing has been determined, it is essential that the district plan, initiate, and coordinate the programming and preliminary engineering portion of the proposed construction.

7-1.04 Commerce Commission Hearings**7-1.04(a) Commerce Commission Jurisdiction**

Rail carriers (Railroads) are corporations engaged in the transportation of passengers and/or goods for hire in the State of Illinois, as defined in the *Illinois Commercial Transportation Law* (625 ILCS 5/18c), and come under the jurisdiction of the Illinois Commerce Commission. The *Code* states, in part:

No public road, highway, or street shall hereafter be constructed across the track of any rail carrier at grade, nor shall the track of any rail carrier be constructed across a public road, highway, or street at grade, without having first secured the permission of the Commission;

The Commission's rules, regulations, and requirements cover the construction, maintenance, division of cost, marking, and signalizing of highway and railroad crossings in the State.

7-1.04(b) Procedure Before the Commission

The Preliminary Engineering Section will work with the Office of Chief Counsel to prepare petitions to the Commission requesting issuance of an Order relative to the crossing of a railroad by a proposed highway improvement when the improvement requiring the crossing was initiated by the Department.

If a hearing is required, the Department must be represented at the hearing to present the evidence through an expert witness who is familiar with the project.

After the case is heard by a duly authorized examiner of the Commission, an Order will be entered either denying or granting the request of the petitioner.

When a Railroad desires to establish a new crossing with a highway, it will file a petition with the Commission and present its case at a hearing which will be attended by representatives from the Office of Chief Counsel, the Preliminary Engineering Section, and the district involved when the Department is a respondent. This action is followed by the decision of the Commission as outlined in its Order. The Railroad must also acquire a permit from the district according to the Department's *Accommodation of Utilities on Right-of-Way of the Illinois State Highway System*.

7-1.05 Procedure for Removing Abandoned Railroad Structures and Grade Crossings

Many highway-railroad grade-separation structures, at-grade crossings, and related track materials of rail lines that have been abandoned remain in place on intersecting public highways. These structures constitute obstructions and encroachments on these highways and should be removed.

Before a Railroad company's right to operate on a particular line has been terminated (i.e., the rail line is abandoned), the Railroad company had authority from the Illinois Commerce Commission to obstruct the highway with the structure in question. After the right to operate is terminated, there remains no authority to obstruct the highway. Therefore, the Railroad company may be treated as any other person obstructing the highway.

The *Illinois Highway Code (605 ILCS 5/9-117)* establishes the procedure for identifying and removing obstructions from public highways. This procedure may be used if it is clear that the highway authority has absolutely no responsibility. Because sole responsibility by a Railroad is uncommon, it is unlikely that this procedure for removing obstructions will be used often. The Office of Chief Counsel may be consulted to help determine whether this procedure is appropriate in a particular situation.

The *Illinois Commercial Transportation Law (625 ILCS 5/18c-7401)* provides an additional statutory means for removing railroad structures from public highways. Under this law, the

Illinois Commerce Commission, after notice and hearing, has the authority to order the removal of abandoned tracks and overhead railroad structures crossing highways, waterways, or other railroads. The Commission may equitably apportion the costs between the parties. This may be based on the assignment of original construction costs and/or the present maintenance responsibility.

Therefore, after determining that the abandonment is final, as per notice from the Bureau of Railroads, and that the facility can be removed and after the district determines that the Railroad refuses or delays the removal, a request should be made to BDE for the removal. BDE will ensure the abandonment is final and request the Office of Chief Counsel to file a Petition for an Order requiring the removal of the facility. The district should be aware that the Commission may order the Department to bear part or all of the cost of removal.

If the Department determines that it should pay the entire cost of structure removal or that the structure presents an immediate danger to the traveling public, the Department may remove the structure without the permission of the Railroad, its successor in interest, or the Illinois Commerce Commission.

Remember that only the Railroad's right to operate is being abandoned. The Railroad may wish to sell its structures or may wish to use the structure at another location. If the Department agrees that the Railroad owns the structure on the highway right-of-way, the Railroad should be allowed to remove it. If the Department removes a structure owned by the Railroad or its assignee, the removed materials should be made available to the rightful owner.

7-1.06 Acquisition of Railroad Property

When the Department requires property interest from a Railroad to complete a highway improvement, sufficient lead time to acquire these interests is essential. It is critical that once it is determined that a project will require the acquisition of property owned or under the control of a Railroad that the Department's Land Acquisition personnel be informed.

7-1.06(a) Acquisition of Railroad Nonoperating Property

The acquisition of nonoperating Railroad property is accomplished according to the criteria outlined in the *Land Acquisition Policies and Procedures Manual*, and the *Federal-Aid Policy Guide*.

7-1.06(b) Acquisition of Railroad Operating Property

Where a proposed highway improvement will cross or longitudinally use a Railroad's operating property, the Department generally will acquire a permanent easement to construct and maintain the improvement. There will be instances when a highway project will require only the temporary use of Railroad property. When this situation occurs, permission to do work of a temporary nature on Railroad right-of-way will be included in the construction and maintenance

agreements between the Department and the Railroad. When there is no agreement, permission to do work of a temporary nature will be obtained by the district Land Acquisition staff.

Occasions where payment for such acquisition may be established and paid are as follows:

1. Land Owned in Fee. When a value is indicated and the Railroad company owning the fee title to its operating right-of-way can continue to operate its facilities either in, above, below, or adjacent to the highway, the Department of Transportation will compensate the Railroad for the right-of-way needed according to the Department's *Land Acquisition Policies and Procedures Manual*. No compensation of any kind will be provided for the acquisition of right-of-way to construct a grade-separation facility where an existing highway grade crossing is eliminated.
2. Land Owned as an Easement. If a Railroad has only an easement for its operating right-of-way and can continue to operate its facilities either in, above, below, or adjacent to the highway, there will be no compensation paid to cross or longitudinally use any part of the right-of-way.

The Railroad shall execute the necessary documents to cover the rights or interests required for the highway project according to the criteria in the *Land Acquisition Policies and Procedures Manual*, regardless of whether or not it owns the fee title or easement. The *Land Acquisition Policies and Procedures Manual* provides the procedure to be used if condemnation is necessary. However, note that permission of the Illinois Commerce Commission is a prerequisite to the filing of the complaint for condemnation and motion for the right of immediate possession and the time required must be considered when scheduling the project.

7-2 AGREEMENTS

7-2.01 General

The Preliminary Engineering Section within BDE is responsible for the preparation and negotiation of formal Agreements between the Department and the Railroad. This includes railroad grade separation projects, grade crossing projects, or projects involving the installation of State facilities (e.g., pipe culverts, storm sewers, underground electrical wiring on Railroad property) or any other work on Railroad property for improvements to the State highway system. The district should submit the necessary crossing data with sufficient lead time allowed for these negotiations. Typically, a year or more is required.

The Agreement will cover:

- division of work and expense involved between IDOT and the Railroad in connection with the crossing improvement;
- responsibilities for the future maintenance of the improvement;
- establishment of the Railroad's share of the cost as determined under the provisions of any one of the several classifications provided in the *Federal-Aid Policy Guide* and Section 7-1.02;
- reference to the acquisition of property rights, (see Section 7-1.06);
- reimbursement of the costs incurred by the Railroad according to the requirements of the *Federal-Aid Policy Guide*;
- coverage of liability during construction operations; and
- reference to or identification of plans and plan approval.

7-2.02 District Data

When Federal-aid funds are proposed, the district will be required to submit the necessary data for programming the project together with the necessary data for negotiations with the Railroad.

The district should submit a report to BDE containing reproducible drawings of the crossing plan prepared in sufficient detail showing the following:

1. Grade Separations. Include the following in the report:
 - existing conditions in the crossing area;
 - a plan and profile of the track or tracks and of the proposed highway improvement for 500 ft (150 m) in each direction from the intersection of the highway and railroad centerlines;

- typical highway and track cross sections;
 - railroad and highway right-of-way limits;
 - distance to a railroad reference marker (i.e., mile post);
 - railroad communication lines including the location of poles and height of wires;
 - existing and proposed drainage ditches, structures, and the direction of flow affecting the railroad;
 - construction details of existing and/or proposed grade crossings in the vicinity; note the type and location of warning devices;
 - details of any track adjustments or runaround tracks proposed, including staging;
 - details for detour road crossings and proposed temporary warning devices, including a plat and description of temporary easement if required;
 - number and speeds of passenger and freight trains using the track or tracks daily;
 - plat and description of the temporary easement as required by Section 7-3.03 for the possible location of the contractor's temporary grade crossing; and
 - all other data pertinent to the project.
2. Grade Crossings. For this report, full-size plan sheets will not be required. Include the following in the report:
- a. Existing Grade Crossing. At existing grade crossings, provide the following:
- number of mainline and subsidiary tracks;
 - type, width, and condition of the existing crossing(s);
 - type and locations of the existing warning devices at the crossing;
 - number and speeds of passenger and freight trains using the crossing daily; and
 - current and ten-year ADT of the highway.
- b. Proposed Grade Crossing. For new grade crossings, provide the following:
- number of tracks;
 - type and width of crossing(s);
 - types and locations of the proposed warning devices;

- anticipated date of construction; and
 - any unusual conditions bearing on the proposed work.
- c. Alternative Methods of Accommodating Traffic. For most projects, include a recommended method for accommodating traffic in the report. Methods are discussed in Chapter 13 and Departmental Policy TRA-3, "Reconstruction and Repair of Railroad Grade Crossings."

7-2.03 Negotiation Procedure

The Railroad Agreement is normally prepared by the Preliminary Engineering Section, Agreements Unit, and sent to the Railroad for review. A copy is also furnished to the district for its review.

When the Railroad receives the Agreement, the Railroad will begin preparation of the plans and cost estimates for the railroad force account work involved. Upon completion, the Railroad will submit the plans and cost estimates to the Department for review.

After the plans and cost estimates have been approved by the Department and the Agreement has been executed by the Railroad, the Agreement is returned to BDE for execution by the Department.

Upon full execution of the Agreement by the Railroad and the Department, one original copy is retained for the BDE file and the Agreement Unit distributes copies of the Agreement to the following:

- Railroad (1 original copy);
- Illinois Commerce Commission (1 copy);
- district (1 copy);
- Bureau of Accounting and Auditing (1 copy at the time the contract obligation document is established); and
- Project Control (1 copy).

7-2.04 Authorization Procedure

When a contract is awarded for a highway improvement which includes work in the area of a highway-railroad grade crossing, and when the affected Railroad is required to adjust its facilities as a part of the improvement, construction delays may be encountered. Generally, the Railroad is authorized to assemble its materials and perform its construction work at the time the contract has been scheduled for letting or at the time the contract is awarded. Because time is required by the Railroad to order materials and schedule work crews, it is not uncommon for

the highway contractor to be unable to proceed with its work in the area of the crossing. Although the delay may not create problems for the highway contractor or for the Department, it does represent a hardship to the motoring public.

To avoid delays and to facilitate construction, the district is allowed to review each project individually to determine if the contractor's operations will be facilitated by authorizing the Railroad to proceed prior to the letting advertisement or award of the highway contract. The district will authorize the Railroad to proceed with the force account work according to the executed railroad Agreement. The authorization should be issued to the same Railroad official to which BDE sent the executed Agreement.

Before an early authorization is given, a most probable highway letting date should have been established so that any necessary coordination between the Railroad and the contractor can be undertaken. Proper timing can also reduce any interim roadway maintenance.

If Federal-aid funds are used, the crossing work also must be programmed and authorized before the advance Railroad work is authorized. The district must request and obtain approval for early authorization from BDE's Project Development/Implementation Section, Program Support Unit and send a copy of the district authorization letter to the Railroad to BDE.

BDE will authorize the railroad work for individual safety crossings not related to highway contracts.

7-2.05 Adjustment Procedures

7-2.05(a) Change Orders

If a plan or estimate change becomes necessary after the Agreement has been executed, the district initiates the change. Extensively review all change orders or amendments to Agreements. Fully explain any deviations between the actual cost or the revised estimate and the original estimate. Submit supporting documentation (e.g., reason for change, copies of revised estimate, statements of actual cost) with the request for the change order or amendment to the Agreement. Changes will not be deemed accepted until approved by BDE.

If the scope, nature, and/or cost of the adjustment has changed significantly, an amendment to the Agreement may be necessary. If it is deemed that such an amendment is needed, submit an Agreement report for the amendment to BDE for processing. See Section 7-2.02.

For minor modifications in scope, nature, and/or cost, the district should complete Form BDE 804 and set forth the following information:

- the extent of the change,
- an estimate of the additional costs,
- the justification for the change, and
- a request for authorization of the change.

Forward Form BDE 804 to BDE for processing. Notification of the change is received through BDE.

Form BDE 804, Request for Authorization for Costs Involving Utility, Railroad, or Local Agency Agreement, may be accessed through the IDOT internet.

7-2.05(b) Final Billing

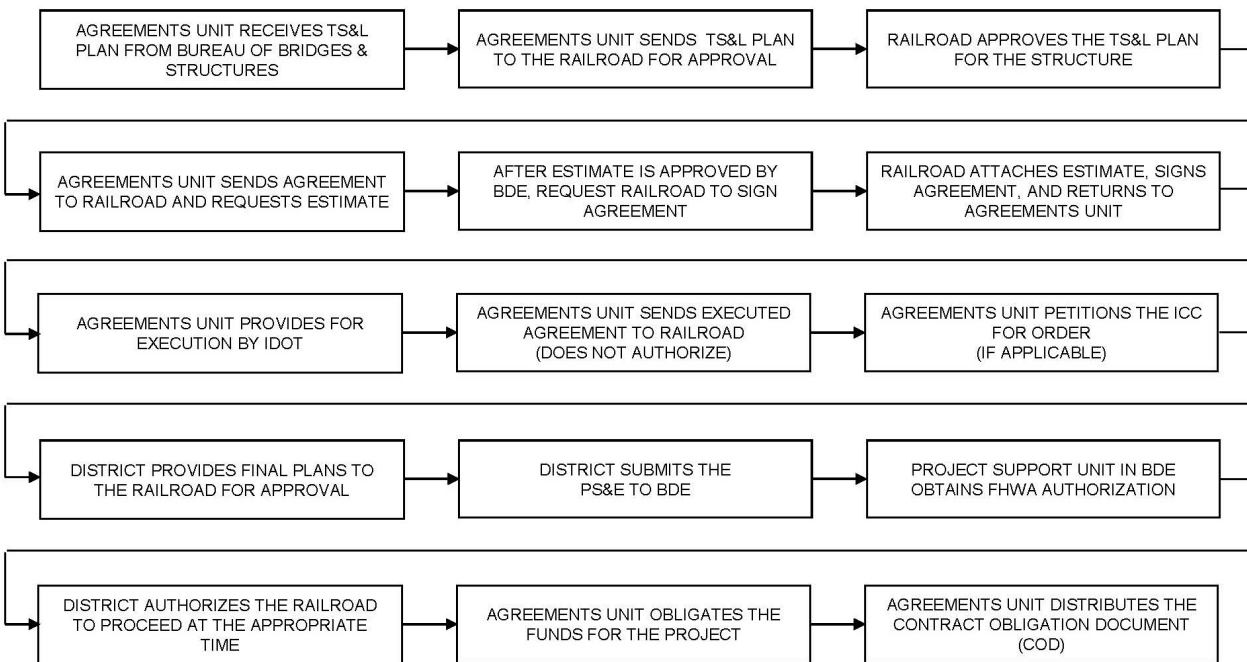
The following applies to processing the final bill for railroad adjustments:

1. Preparation of Final Billing. Ensure that the final bill complies with all requirements of the *Federal-Aid Policy Guide*, Part 140, Subpart I.
2. Review of Final Billing. The district will review the final bill to determine whether or not the final bill reflects the labor, equipment, and materials used in the adjustment.
3. Submission of Final Billing. Submit final bills and recommendations to the Bureau of Accounting and Auditing for audit.
4. Billing Discrepancies. If the final cost as approved by audit exceeds the estimated amount of the adjustment and Form BDE 804 was not submitted in the interim, explain the increase and submit appropriate recommendations on Form BDE 804.

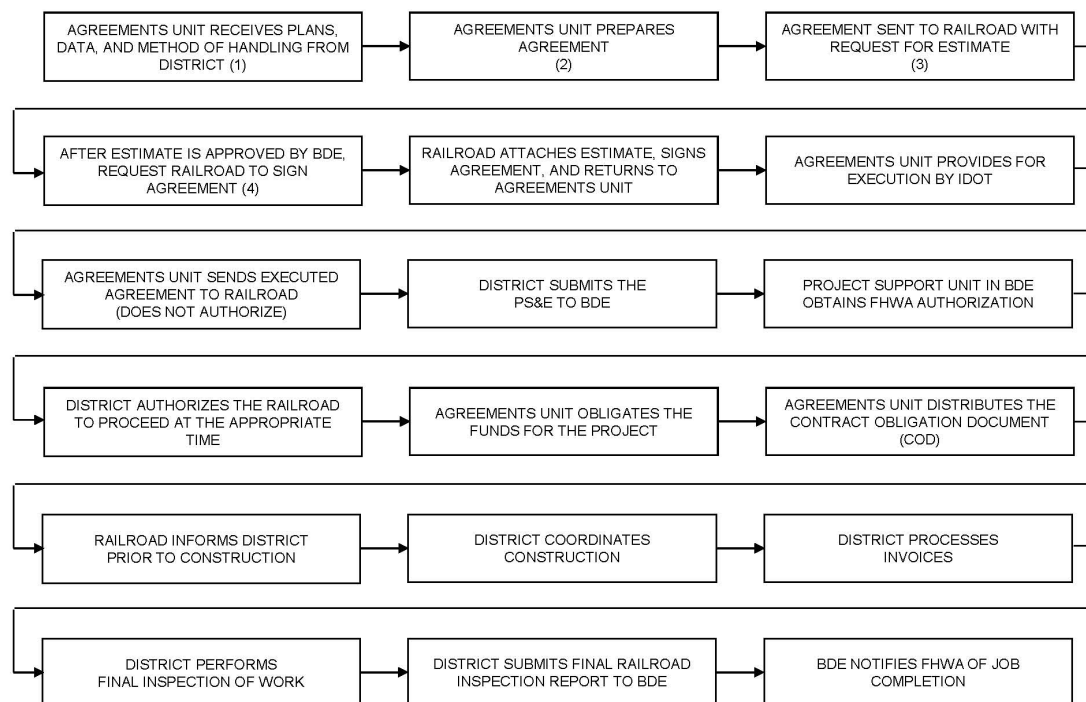
7-2.06 Railroad Agreement Process

Figures 7-2.A, 7-2.B, and 7-2.C illustrate flowcharts for the agreement negotiation processes for the following projects:

- Figure 7-2.A — grade separation structure projects,
- Figure 7-2.B — grade crossings/non-safety projects, and
- Figure 7-2.C — grade crossings/safety projects.



**RAILROAD AGREEMENT PROCESS
(Grade Separation Structure Projects)
Figure 7-2.A**



(1) District submittal should indicate whether an interconnection is needed, including any timing requirements for the railroad control circuitry. Interconnection plans and requirements will be approved by the Central Bureau of Operations prior to submittal to the Railroad.

(2) When signal improvements are involved, the typical agreement states the following:

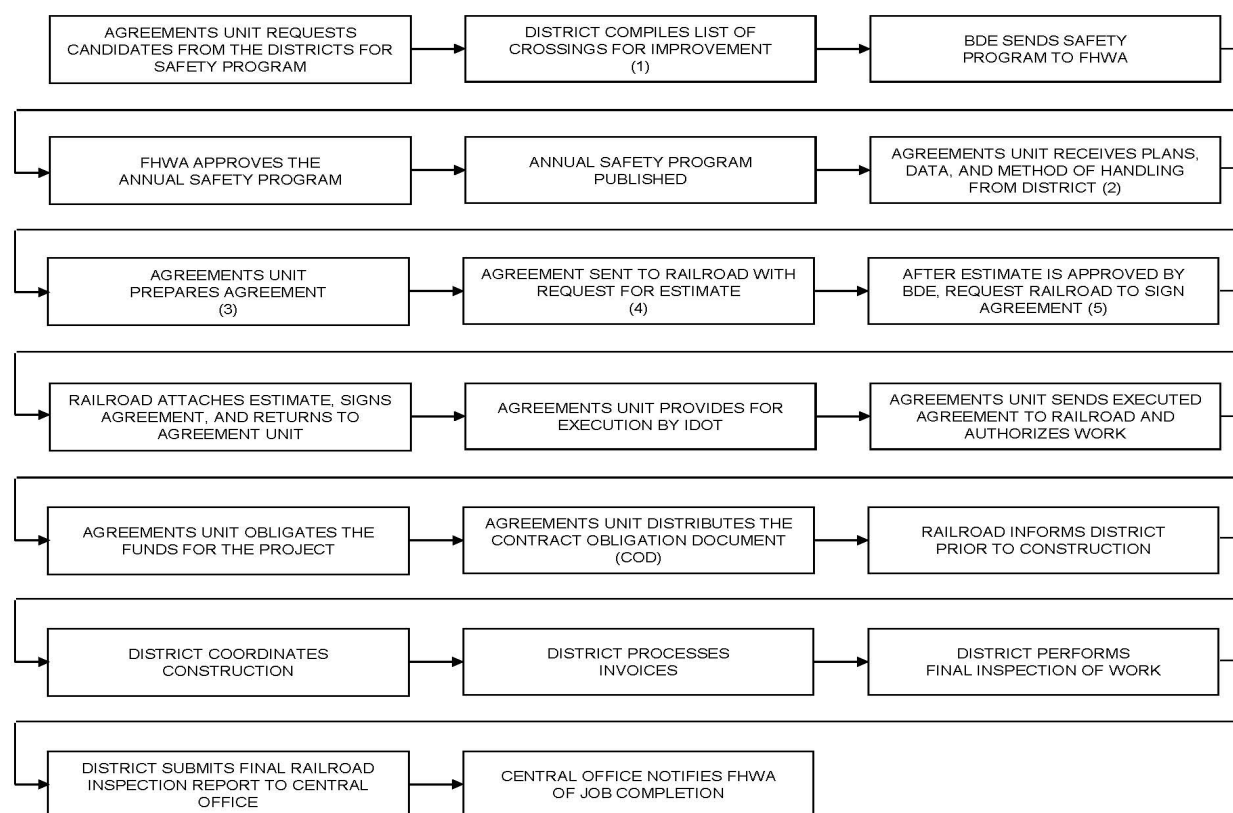
The COMPANY will petition the Illinois Commerce Commission in accordance with 92 Illinois Administrative Code 1535 to take jurisdiction in this matter and to enter such orders as may be necessary.

(3) The transmittal to the Railroad should indicate any interconnection requirements.

(4) The Railroad's interconnection plans will be approved by the Central Bureau of Operations prior to the approval of the estimate.

RAILROAD AGREEMENT PROCESS (Grade Crossing/Non-Safety Projects)

Figure 7-2.B



- (1) List based on annual inspections, expected crashes, and complaints.
- (2) District submittal should indicate whether an interconnection is needed, including any timing requirements for the railroad control circuitry. Interconnection plans and requirements will be approved by the Central Bureau of Operations prior to submittal to the Railroad.
- (3) When signal improvements are involved, the typical agreement states the following:
The COMPANY will petition the Illinois Commerce Commission in accordance with 92 Illinois Administrative Code 1535 to take jurisdiction in this matter and to enter such orders as may be necessary.
- (4) The transmittal to the Railroad should indicate any interconnection and requirements.
- (5) The Railroad's interconnection plans will be approved by the Central Bureau of Operations prior to the approval of the estimate.

RAILROAD AGREEMENT PROCESS (Grade Crossing/Safety Projects)

Figure 7-2.C

7-3 DESIGN FUNCTIONS

7-3.01 General

As State highways and railroads are expanded or modernized, it is inevitable that new highway-railroad crossings will need to be established and that existing crossings will need to be modernized, reconstructed, or eliminated. Basically, there are two methods of accomplishing these crossings:

1. At-Grade Crossing. This method is where the highway and railroad intersect at the same elevation requiring proper warning to reduce the inherent hazard of collisions between trains and highway vehicles.
2. Grade Separation Crossing. This method is where the inherent collision hazard is eliminated by the construction of a structure that carries the highway over or under the railroad.

7-3.02 At-Grade Crossings

7-3.02(a) Selection Guidelines for Warning Devices

Warning devices will be warranted at all highway-railroad crossings where grades are not separated. Select the type of warning device according to the following:

1. General. At a minimum, provide reflectorized crossbucks, pavement markings, and advance warning signs as indicated in the *Illinois Manual on Uniform Traffic Control Devices* at all crossings.
2. Flashing Signals. Install flashing signals at crossings where the warrants for gates are not met and where the expected crash frequency equals or exceeds 0.02. Use Equation 7-3.1 and the factors in Figure 7-3.A to determine the expected crash frequency.

$$ECF = A \times B \times T$$

Equation 7-3.1

Where:

ECF	=	Expected Crash Frequency
A	=	Traffic factor, see Figure 7-3.A
B	=	Component factor, see Figure 7-3.A
T	=	Current number of trains per day

3. Cantilevered Flashing Signals. Use cantilevered flashing signals, in addition to other warning devices, on multilane highways that qualify for active warning devices and where there is the possibility of a truck blocking the view of the roadside signals. Also, consider providing cantilever signals at high-frequency crash locations that possibly could be improved by more visible signals.

A Factors

VEHICLES PER DAY (10-YR. ADT)	FACTOR
250	0.000347
500	0.000694
1000	0.001377
2000	0.002627
3000	0.003981
4000	0.005208
5000	0.006516
6000	0.007720
7000	0.009005
8000	0.010278
9000	0.011435
10000	0.012674
12000	0.015012
14000	0.017315
16000	0.019549
18000	0.021736
20000	0.023877
25000	0.029051
30000	0.034757

B Factors — Basic Values for Existing Devices

Components	Basic Value Adjustments
Crossbucks, traffic volume less than 500 vehicles per day	3.89
Crossbucks, urban	3.06
Crossbucks, rural	3.08
Stop signs, traffic volume less than 500 vehicles per day	4.51
Stop signs	1.15
Wigwags	0.61
Flashing lights, urban	0.23
Flashing lights, rural	0.93
Gates, urban	0.08
Gates, rural	0.19

CRASH FREQUENCY FACTORS
(Highway-Railroad Grade Crossings)

Figure 7-3.A

4. Gates and Flashing Signals. Provide flashing signals and gates where one or more of the following conditions are met:

- multiple mainline railroad tracks;
- multiple tracks at or in the vicinity of the crossing which may be occupied by a train or locomotive, so as to obscure from view the movement of another train approaching the crossing;
- high-speed train operation combined with limited sight distance at either single or multiple track crossings;
- a combination of high speeds and moderately high volumes of highway and railroad traffic;
- either a high volume of vehicular traffic, high number of train movements, substantial numbers of school buses or trucks carrying hazardous materials, unusually restricted sight distance, continuing crash occurrences, or any combination of these conditions;
- the expected crash frequency for flashing lights exceeds 0.02 and the benefit-cost ratio equals or exceeds 1.0 (the method for determining the benefit-cost ratio is shown in Figure 7-3.B); and/or
- a diagnostic team recommends them.

In individual cases where a diagnostic team justifies that gates are not appropriate, gates will not be required.

5. High-Type Device. Provide a higher type of warning device which may not be justified under any of the preceding warrants based on continuing or potential crash occurrence due to:

- unusual track or roadway geometrics;
- restricted sight distance; and/or
- other unusual conditions, such as where there exist exceptional crash consequences to a large number of people as rail or highway passengers or as the result of a crash involving hazardous materials.

In other instances, a lower level device may be justified if concurred with by a diagnostic team.

Definitions: ECF = Expected Crash Frequency = $A \times B \times T$ Equation 7-3.1

Z = Cost of crash = ratio of deaths and injuries per crash (average for latest 3 years in Illinois) x cost per crash (National Safety Council crash cost data which is documented and periodically updated by BDE)

U = Cost of flashing lights divided by expected life = _____

V = Yearly maintenance cost of flashing lights = _____

Y = Cost of gates divided by expected life = _____

W = Additional annual cost to maintain = _____
gates instead of flashing lights

L = Cost of grade separation divided by expected life = _____

M = Additional annual cost to maintain grade = _____
separation instead of gates

(Expected life can be assumed as 20 to 30 years.)

Step 1: ECF for present installation = $A \times B \times T$ = _____

Step 2: ECF for proposed installation = $A \times B \times T$ = _____

Step 3: Savings in ECF per year = Step 1 - Step 2 = _____

Step 4: Benefit = $Z \times \text{Step 3}$ = \$ _____

Step 5: Cost of proposed installation = $Y + W$, or $U + V$, or $L + M$ = \$ _____

Step 6: Benefit-Cost Ratio = Step 4 divided by Step 5 = _____

BENEFIT-COST RATIO ANALYSIS
(Highway-Railroad Crossings)

Figure 7-3.B

Where the distance measured along the centerline of the highway between two regularly used adjacent tracks is less than 100 ft (30 m), consider the crossing as a multiple track crossing and install warning devices accordingly. Where the distance is 100 ft (30 m) or more, consider each crossing as individual crossings and signalize each according to the preceding warrants.

7-3.02(b) Example for Warning Device Selection

* * * * *

Example 7-3.1

Given: Urban Area
Crossbuck Protection
10-year ADT = 5000 Vehicles Per Day
Current Train Traffic = 5 Trains Per Day

Problem: Determine the appropriate warning devices that should be used at this crossing.

Solution: First determine the expected crash frequency of the existing crossbuck protection.

Expected Crash Frequency:

$$ECF = 0.006516 \times 3.06 \times 5$$

$$ECF = 0.10$$

ECF = 1 crash every ten years

Crash frequency is greater than 0.02 indicating the need for higher type device.

Try flashing lights:

$$"B" = 0.23$$

$$ECF = 0.006516 \times 0.23 \times 5$$

$$ECF = 0.01$$

Therefore, flashing lights are warranted.

* * * * *

7-3.02(c) Circuitry Devices

Refinements to activation circuitry should be recommended where the credibility of the warning devices could be beneficially increased. This includes shortening the signal "starts" to reflect reduced train speeds, or installing motion detectors or constant warning time devices (predictors). Consider the following:

1. Grade Crossing Predictors. Install grade crossing predictors (GCP/constant warning time) circuitry at crossings with ADT of at least 1000 vehicles and an average daily train traffic of at least 5 trains per day, or where there are concentrations of train or vehicular traffic during “rush hours” and where:
 - there are switching moves on the approach circuits,
 - at least 25% of the average daily trains operate at 25 mph (40 km/h) slower than the fastest train on the line, or
 - there is an unusual track and crossing geometry.
2. Motion Detectors.
 - a. Gates. Where gates are present, provide motion detectors where there:
 - is stopping or other lengthy occupancy of the approach circuits,
 - are new gate installations,
 - is upgrading of crossings with flashing signals to gate installations, or
 - are major control circuitry changes required at existing installations.
 - b. Flashing Signals. For flashing signals, provide motion detectors where there:
 - is stopping or other lengthy occupancy of the approach circuits,
 - are new flashing signal installations with ADT of 1000 vehicles or more and 5 or more trains per day, or
 - are major control circuit changes required by changes in or additions to flashing signals at crossings with ADT of 1000 vehicles or more and 5 or more trains per day.

Note that the cost differential between grade crossing predictors (GCP/constant warning time) and motion detector circuitry is minor in comparison to the total installation cost. In addition, grade crossing predictor (GCP/constant warning time) circuitry can be adjusted to a wider, more variable set of train traffic conditions. When contemplating circuitry improvements, it is best to contact the Railroad to make an accurate assessment of train traffic and a more informed decision on circuitry improvements.

7-3.02(d) Barrier Systems

The following will apply to barrier systems around warning devices:

1. General. Do not provide barrier systems (e.g., guardrail, impact attenuators) at railroad grade crossings except in extraordinary circumstances. In most cases, the roadside

barrier presents more of a hazard than the railroad warning device it shields. Also, it may block a lateral escape route in advance of the signal. Extraordinary circumstances which may justify the use of a roadside barrier in the vicinity of a railroad crossing warning device include:

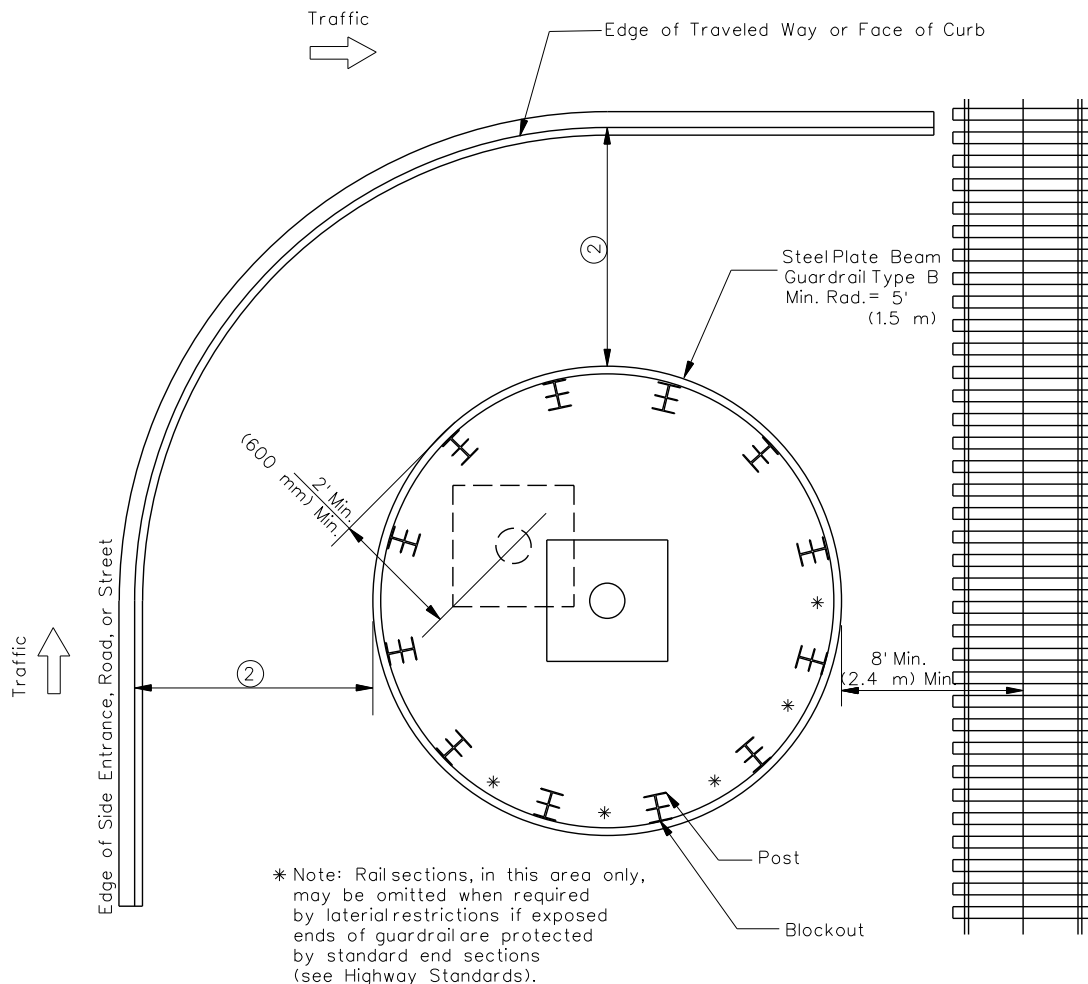
- locations where the approach roadway is on a fill with side slopes steeper than 1V:3H and greater than 10 ft (3.0 m) in height,
 - locations with a high-crash history involving warning device where a cost-effective analysis demonstrates a roadside barrier is warranted, and
 - locations where there will be a temporary delay in moving warning devices for widening of a highway.
2. Installation. See Chapter 38 and the *Highway Standards* for the installation of guardrail at crossings.
 3. Special Conditions. In industrial or other areas involving low-speed highway traffic and where warning devices are vulnerable to damage by turning truck traffic, ring-type guardrail may be installed to provide protection for warning devices. Ring-type guardrail should conform to Figures 7-3.C and 7-3.D. Substitute shielding devices (e.g., concrete, railroad ties, railroad rails) are not permitted.
 4. Signals. Do not use breakaway or frangible bases for cantilever signal supports.
 5. Maintenance of Barriers. The Department will maintain all longitudinal guardrail and impact attenuators. The Railroad will be responsible for maintaining the ring-type guardrail.
 6. Approval. Approval for the erection of any roadside barrier by the Railroad must be obtained in writing from BDE.

7-3.02(e) Approaches

When a grade crossing improvement is undertaken, that portion of the roadway lying within or adjacent to the crossing should, if necessary, be improved to provide a smooth approach to the crossing so that the driver's attention will not be diverted from warning devices or oncoming trains by rough approaches. Also, consider removing or relocating any obstructions to a motorist's view of warning devices within the roadway. This includes utility poles, shrubs, trees, signs, etc.

7-3.02(f) Design Considerations

When it has been determined that an at-grade crossing is appropriate at a highway-railroad intersection, the district will prepare a plan and profile sheet for the highway showing complete

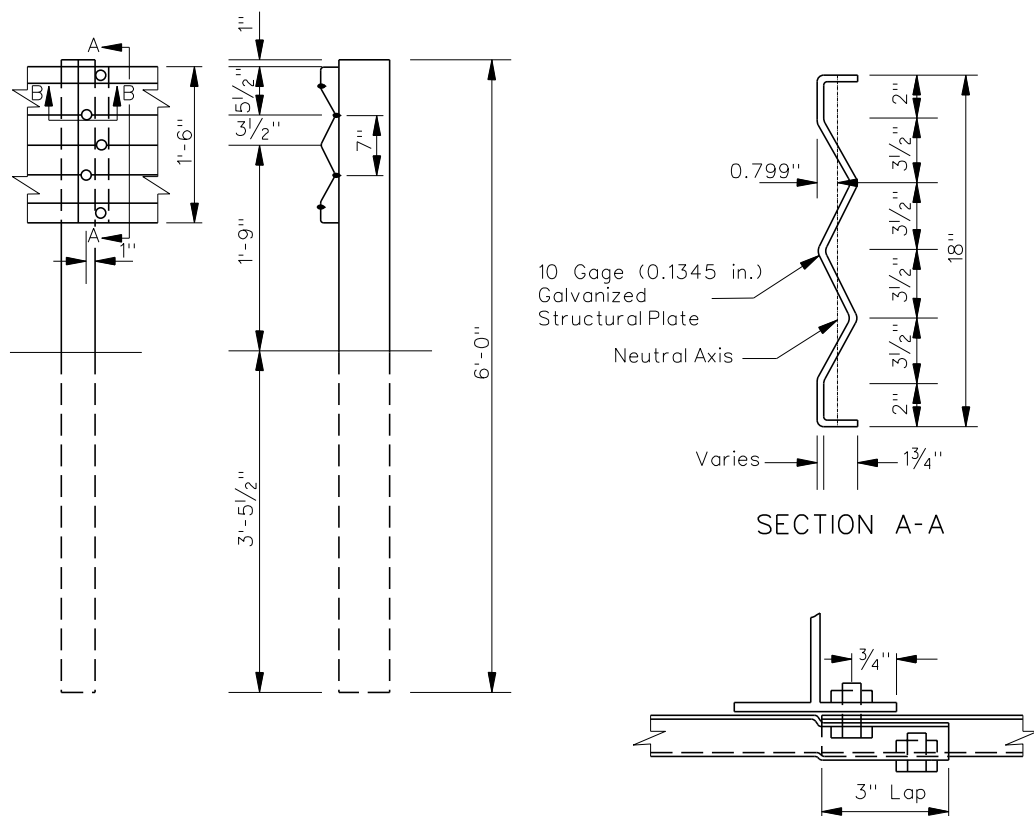


NOTES:

1. All construction and material should conform to the latest editions of the IDOT *Highway Standards* and IDOT *Standard Specifications*.
2. Minimum offset determined by general conditions with 6 ft (1.8 m) and 2 ft (600 mm) desirable for rural and urban sections respectively. Offset the guardrail a minimum of 6 ft (1.8 m) where the roadway cross sections include flush shoulders. In no case shall guardrail encroach upon the shoulder.
3. Guard ring may be off center of warning device when required by lateral restrictions.
4. If either the size or the number of warning device foundations will preclude the use of a circular ring as shown, an appropriate amount of tangent guardrail may be included.
5. If, due to geometrics of the warning device location, it is not practical to provide a 5-ft (1.5-m) minimum radius guard ring, with minimum clearance, the alternative structural plate ring should be considered; see Figure 7-3.D.

RAILROAD WARNING DEVICE GUARDRAIL
(For Roadways Up to 45 mph (70 km/h))

Figure 7-3.C



General Notes:

1. All bolts have a 5/8" diameter and length as required.
2. Galvanize all bolts and nuts according to the requirements of AASHTO M232.
3. All holes in posts are 3/4" diameter.
4. The rail elements should conform to the material requirements and be galvanized according to AASHTO M180.
5. Structural Plate Guard Ring and posts will conform to the applicable portions of the IDOT Standard Specifications and Highway Standards.
6. The inch-pound units have been retained for use by Railroads.

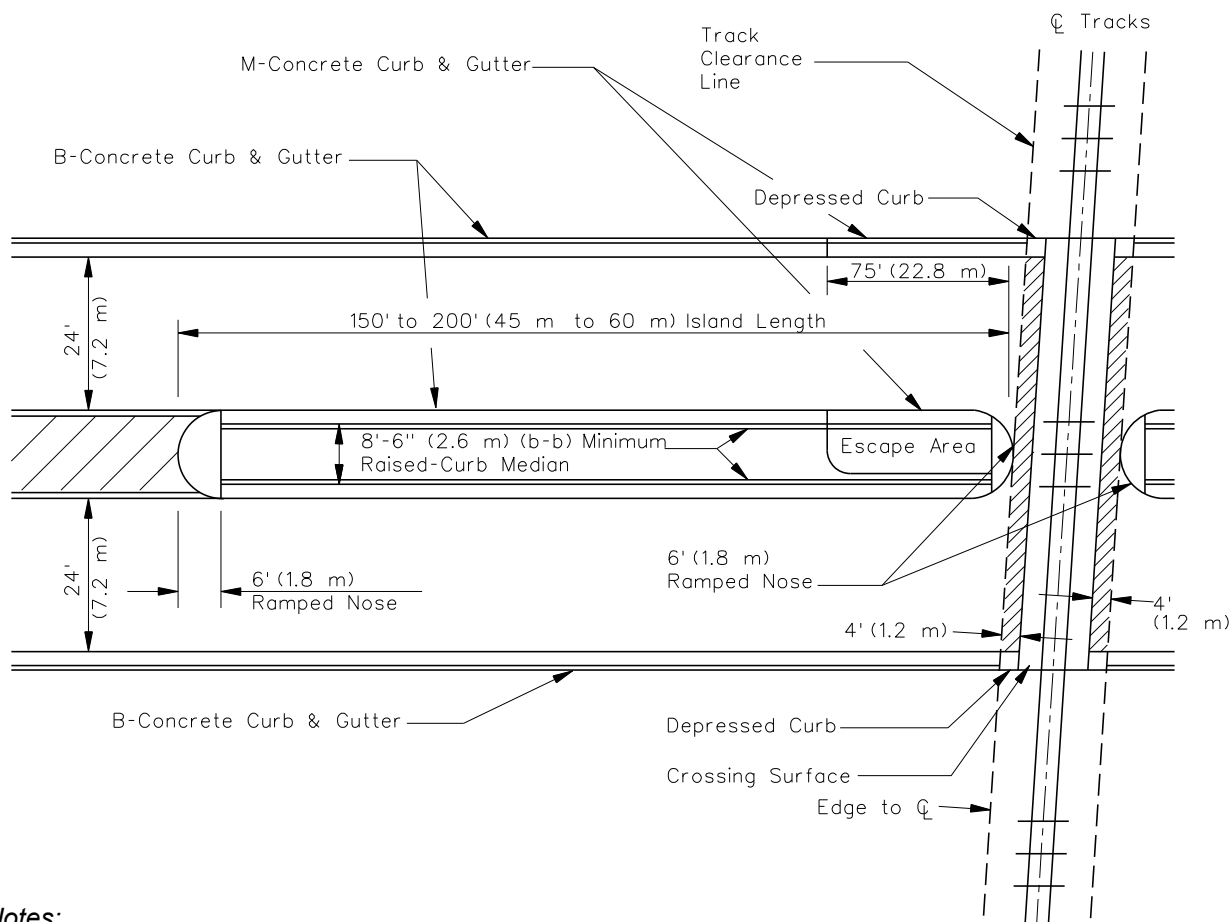
ALTERNATIVE STRUCTURAL PLATE GUARD RING
(For Radius, 5 ft (1.5 m))
Figure 7-3.D

information for existing and proposed railroad facilities; see Section 7-2.02. These plans will be used by BDE for negotiating with the Railroad involved. When designing grade crossings, consider the following:

1. Grade Crossing Proper.

- a. Surface Material. Where the roadway traffic equals or exceeds 1000 ADT, use prefabricated rubber or concrete surface materials. For ADT less than 1000, timber and/or asphalt crossings may be used.
- b. Medians. Where median-mounted warning devices will be installed and other than an earth median is adjacent to a grade crossing, the median should have a minimum median width of 8.5 ft (2.6 m) (10 ft (3.0 m) desirable) back-to-back of curb. Depress all medians and curbs on approaches to the crossing to the level of the pavement edge or gutter flag within the track clearance line which is parallel to and 8 ft (2.4 m) from the centerline of the nearest track; see Figure 7-3.E.
- c. Location. Where no barrier curbs extend along the pavement, the crossing proper and islands between tracks should extend to parallel lines which are 8 ft (2.4 m) outside of the pavement edges or to edge of stabilized shoulder, whichever is greater. Where barrier curbs along the pavement are present, the crossing proper and islands should extend to the back of the curb except where the opening along the curb exceeds 55 ft (16.8 m), in which case the crossing should extend 3 ft (900 mm) outside the curb face.
- d. Sidewalks. Where sidewalks are present, also include a sidewalk crossing. Where sidewalks abut or are in close proximity to the back of curb, the district may elect to extend the prefabricated crossing materials to the outer limits of the sidewalk.
- e. Pavement. Construct the approaches to grade crossings and the islands between the tracks according to the *IDOT Highway Standards*. This also applies where a Railroad constructs a crossing through an existing pavement.
- f. Grades. Design the grades on approaches to grade crossings, as a minimum, according to the criteria in the *92 Illinois Administrative Code*, Chapter III, Subchapter C, Section 1535.204.

2. Grade Crossing Warning Devices. Ensure the design, installation, and operation of grade crossing warning devices conforms to the *Illinois Manual on Uniform Traffic Control Devices (ILMUTCD)* and *92 Illinois Administrative Code*, Chapter III, Subchapter C, Part 1535 as applicable.



Notes:

1. *Where a raised-curb, flush, or traversable type median is used on the roadway, provide B-6 or B-9 (B-15 or B-22) raised-curb median on crossing approaches and provide M-2 or M-4 (M-5 or M-10) raised-curb median on crossing departures adjacent to each side of the railroad track(s); see Section 34-2.04.*
2. *In addition to deterring vehicular movements over the track(s) in the median area, the raised-curb median provides a space for mounting railroad warning device units, if required. Also, see Section 36-8.*
3. *If the railroad tracks are located close to a cross street and lie within the left-turn lane of the intersection, this situation will require a special design and the use of barrier type curb along the median adjacent to the turn lane.*
4. *The median should have a minimum width of 8.5 ft (2.6 m) (10 ft (3.0 m) desirable) back-to-back of curb.*

TYPICAL MID-BLOCK MEDIAN TREATMENT ADJACENT TO RAILROAD CROSSINGS
(Multilane Urban and Suburban Highways)

Figure 7-3.E

Locate warning device units a minimum of 12 ft (3.6 m) from the centerline of near track and 4 ft 3 in (1.3 m) back of the face of curb or outside the edge of paved shoulder or 8 ft 3 in (2.5 m) outside the edge of traveled way. The 4 ft 3 in (1.3 m) and 8 ft 3 in (2.5 m) dimensions allow the clearances noted in the *ILMUTCD* in the event the railroad installs lamp units equipped with large backgrounds.

3. Sight Distance. The AASHTO *A Policy on Geometric Design of Highways and Streets* presents criteria to determine the applicable sight triangle at a highway-railroad crossing.

7-3.02(g) Signalized Intersections

Where a signalized highway intersection is located near a railroad grade crossing, ensure that there is sufficient storage distance between the highway intersection and railroad grade crossing to allow for the storage of stopped vehicles at the intersection. Where this is not practical, coordinate the traffic signal system with the railroad's approach circuitry to allow stopped traffic on or near the grade crossing to clear the crossing upon the approach of a train. Where the railroad crossing is signalized, interconnect the two signal systems. For guidance on the design and coordination of traffic signals near grade crossings, review the *ILMUTCD*, the ITE publication *Preemption of Traffic Signals At or Near Railroad Grade Crossings with Active Warning Devices*, Section 36-8, and Chapter 57.

All grade crossings requiring an interconnection must be coordinated with the Bureau of Operations. See the flowcharts in Figures 7-2.A, 7-2.B, and 7-2.C for a general outline of the coordination process.

7-3.03 Grade-Separated Structures

7-3.03(a) Warrants

A grade separation should be provided where a highway is constructed or reconstructed across a railroad when the crash frequency for gates exceeds 0.02 and the benefit-cost ratio equals or exceeds 1.0.

A grade separation should be provided where an expressway in a rural area is constructed or reconstructed across the railroad.

7-3.03(b) Design Considerations

Where grade separation is warranted as determined by the criteria contained in Section 7-3.03(a), BDE will be responsible for the negotiations with the railroad involved to determine who will design the structure; see Section 7-2. Plans prepared by or for the Department must be approved by the Railroad and should show:

- the structural design features;
- the vertical clearance from top of rail to under clearance of superstructure;
- the distance between track centers for multiple-track crossing;
- the lateral clearance from track center to face of adjacent pier (or abutment);
- the distance to a designated railroad reference marker (i.e., mile post) from centerline of bridge;
- the flow line and cross section of existing and proposed drainage features, including drainage structures;
- the location and stationing of railroad right-of-way lines;
- the wire lines and utility facilities located on railroad right-of-way; and
- other pertinent features affecting the Railroad's interests.

For details of the geometric design, see the *Bureau of Bridges and Structures Manual*.

Section 7-1.06 addresses acquisition of the necessary railroad property for the structure. The contractor shall be responsible for temporary railroad crossings for use by the Contractor in accordance with Article 107.10 of the *Standard Specifications*.

7-3.04 Other Agency References

For uniformity, use the applicable Federal regulations on both Federally and non-Federally funded projects. Clearance and public safety aspects of all projects shall conform with the regulations of the Illinois Commerce Commission. Applicable publications of these agencies are provided in Figure 7-3.F.

PUBLICATION	SUBJECT
*FPG, Chapter 1, Subchapter B, Part 140, Subpart I	Reimbursement for Railroad Work
*FPG, Chapter 1, Subchapter G, Part 646, Subpart B	Railroad-Highway Projects
*FPG, Chapter 1, Subchapter G, Part 646, Subpart A	Railroad-Highway Insurance Protection
92 <i>Illinois Administrative Code</i> , Chapter III, Subchapter C, Part 1500	Minimum Clearances Applicable to Tracks, Structures, Fixtures, and Other Appurtenances of Railroads
92 <i>Illinois Administrative Code</i> , Chapter III, Subchapter C, Part 1535	Crossings of Rail Carriers and Highways
<i>Illinois Supplement to the Manual on Uniform Traffic Control Devices</i>	

*FPG = FHWA Federal-Aid Policy Guide.

PERTINENT PUBLICATIONS OF OTHER AGENCIES

Figure 7-3.F

Chapter Seven

RAILROAD COORDINATION

BUREAU OF DESIGN AND ENVIRONMENT MANUAL

Chapter Seven
RAILROAD COORDINATION

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Chapter Seven

RAILROAD COORDINATION

7-1 ADMINISTRATIVE FUNCTIONS

7-1.01 Selection of Projects

The *Federal Highway Safety Act* authorizes funds for the improvement of highway-railroad safety by installing or upgrading warning devices.

The available program funds are allocated as a specific dollar amount between the Bureaus of Design and Environment and Local Roads and Streets with recommendations for distribution among the various types of projects (e.g., warning devices, abandoned crossings) for each Bureau's program.

BDE allocates funds to each district according to a weighted average of a district's share of the total track-lanes of crossings in the State, modified by demonstrated need. Each district prepares a list of candidate projects and proposed types of improvement for inclusion in the upcoming year's program, based on the following criteria:

- the expected crashes (see Section 7-3.02 to determine if existing warning devices are sufficient for the expected crashes);
- crash history;
- public complaints;
- individual observations made during the annual grade crossing inspection (the credibility of the existing warning devices should be carefully checked); and
- Railroad company's request for improvements.

For additional guidance on the selection of projects, review the FHWA *Railroad-Highway Grade Crossing Handbook*. Consider the following when determining project selection:

- removal of non-complying guardrail around warning device bases; and
- removal of abandoned at-grade crossings.

Make every attempt to coordinate any proposed warning device projects on crossings of State-maintained highways where track circuitry overlaps those of adjacent local crossings. Exchange this information with the Bureau of Local Roads and Streets to coordinate the work and programming.

BDE, working with the Division of Traffic Safety, Bureau of Statewide Program Planning within the Office of Planning and Programming, and the Illinois Commerce Commission, may identify a

list of high-crash locations not included in the district's lists. BDE will convene a "Diagnostic Team" to investigate each crossing on the list. BDE will document any deficiencies discovered and solutions proposed.

| The priority lists are finalized and published as the "FY 20__ Highway Safety Improvement Program." This publication becomes the official program of the Department. The selected projects are then sent to FHWA by BDE with a request for authorization as soon as the Federal funds become available. The projects are then administered as Federal-aid projects under the Project Oversight Agreement.

7-1.02 Financial Participation

7-1.02(a) Grade-Separation Improvements

The following financial arrangements will apply:

1. New Structure — Department Project. Where a new grade-separation structure will be constructed as a result of a project initiated by the Department, 100% of the cost will be borne by the Department except for the following:
 - a. Active Warning Devices. Where the principal grade crossing or crossings, at which active warning devices are in place or ordered to be installed by the Illinois Commerce Commission, will be closed after completion of the project, the Railroad will be required to bear 5% of the cost of the structure and approaches.

Where the number of traffic lanes will increase, the Railroad's share will be based on the estimated cost of the theoretical structure and approaches required to separate the grade for the existing number of traffic lanes.
 - b. Additional Track(s). Where the Railroad has no definite plan for the installation of additional future tracks within a reasonable time, the Railroad will be responsible for 100% of the increased costs due to providing space for the additional future track(s).
2. New Structure — Railroad Project. Where a new grade-separation structure will be constructed as a result of a Railroad-initiated project, the Railroad will be responsible for 100% of the cost.
3. Existing Structure — Department Project. Where an existing grade-separation structure on a State highway will be reconstructed as a result of a project initiated by the Department, 100% of the cost will be borne by the Department; however, this policy will not abrogate the covenants of any existing agreement that remains in effect containing provisions for maintenance or reconstruction of the structure.
4. Existing Structure — Railroad Project. Where an existing grade-separation structure (maintained by the Railroad) on a State highway is determined by the Department to be

unsafe due to physical damage or deterioration and must be reconstructed, the Railroad will be responsible for 100% of the estimated cost of the theoretical structure required to reconstruct the existing structure to its original design loading or 100% of the estimated cost to repair the existing structure to its original design loading.

7-1.02(b) Grade-Separation Maintenance

The Department will maintain new grade-separation structures on Department initiated construction. Any structures constructed as a Railroad initiated project will be maintained by the Railroad. In all cases, the Railroad will maintain the track, track bed, and railroad appurtenances.

When the Department is responsible for the maintenance of an existing structure, either by the terms of an agreement or by an Illinois Commerce Commission Order, maintenance of the Department initiated reconstructed structure will remain the responsibility of the Department.

When the Railroad is responsible for the maintenance of an existing structure, either by the terms of an agreement or by an Illinois Commerce Commission Order, maintenance of the reconstructed structure will remain the responsibility of the Railroad unless an exception is granted.

When it is in the best public interest, the Department may relieve a railroad of its maintenance obligations for a structure in return for a lump-sum payment based on the capitalized cost for perpetuation of the structure. This capitalized cost will be determined according to the following:

1. Service Life. For calculations, assume that no routine maintenance is performed and that each of the structural components will be replaced at the end of its service life in perpetuity. For most structures, the service life of the substructure will be assumed to be 100 years and, for the superstructure, 50 years. Calculate the costs for replacing the existing structural components at current prices.
2. Interest Rate. Determine the interest rate by calculating the average annual rate of return to the nearest 0.25% increment using the current fiscal year and the two preceding fiscal years. The annual rate of return for each fiscal year can be obtained from the State Treasurer's Office.
3. Capital Cost. The capitalized cost should be derived using the equation shown in Figure 7-1.A.

$$C = y \left[\frac{1}{(1+i)^n} \right] + x \left[\frac{1}{(1+i)^m} \right] + \left[\frac{\left(y \left[\frac{i}{(1+i)^{50} - 1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^n} \right] + \left[\frac{\left(x \left[\frac{i}{(1+i)^{100} - 1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^m} \right]$$

Where:

C	=	capitalized cost
x	=	cost of replacing substructure, in kind, at current prices
y	=	cost of replacing superstructure, in kind, at current prices
m	=	remaining life of substructure, years
n	=	remaining life of superstructure, years
100	=	service life of substructure, years
50	=	service life of superstructure, years
i	=	interest rate, decimal

$$\left[\frac{1}{(1+i)^m} \right] = \text{single payment present worth factor for } m \text{ years}$$

$$\left[\frac{1}{(1+i)^n} \right] = \text{single payment present worth factor for } n \text{ years}$$

$$\left[\frac{i}{(1+i)^{100}-1} \right] = \text{sinking fund factor for 100 years}$$

$$\left[\frac{i}{(1+i)^{50}-1} \right] = \text{sinking fund factor for 50 years}$$

$$x \left[\frac{1}{(1+i)^m} \right] = \text{present cost which expresses the cost of replacing the substructure } m \text{ years from the present}$$

$$y \left[\frac{1}{(1+i)^n} \right] = \text{present cost which expresses the cost of replacing the superstructure } n \text{ years from the present}$$

$$\left[\frac{\left(x \left[\frac{i}{(1+i)^{100}-1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^m} \right] = \text{present cost which expresses the cost of replacing the substructure at 100-year intervals in perpetuity beginning at a point in time } m \text{ years from the present}$$

$$\left[\frac{\left(y \left[\frac{i}{(1+i)^{50}-1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^n} \right] = \text{present cost which expresses the cost of replacing the superstructure at 50-year intervals in perpetuity beginning at a point in time } n \text{ years from the present}$$

CAPITAL COST DETERMINATIONS

Figure 7-1.A

* * * * *

Example 7-1.1

Given: An original highway-railroad grade structure was built in 1940. In 1963, the original superstructure was removed and replaced. Maintenance of the structure has been borne equally by the Railroad and the Department by Illinois Commerce Commission Order.

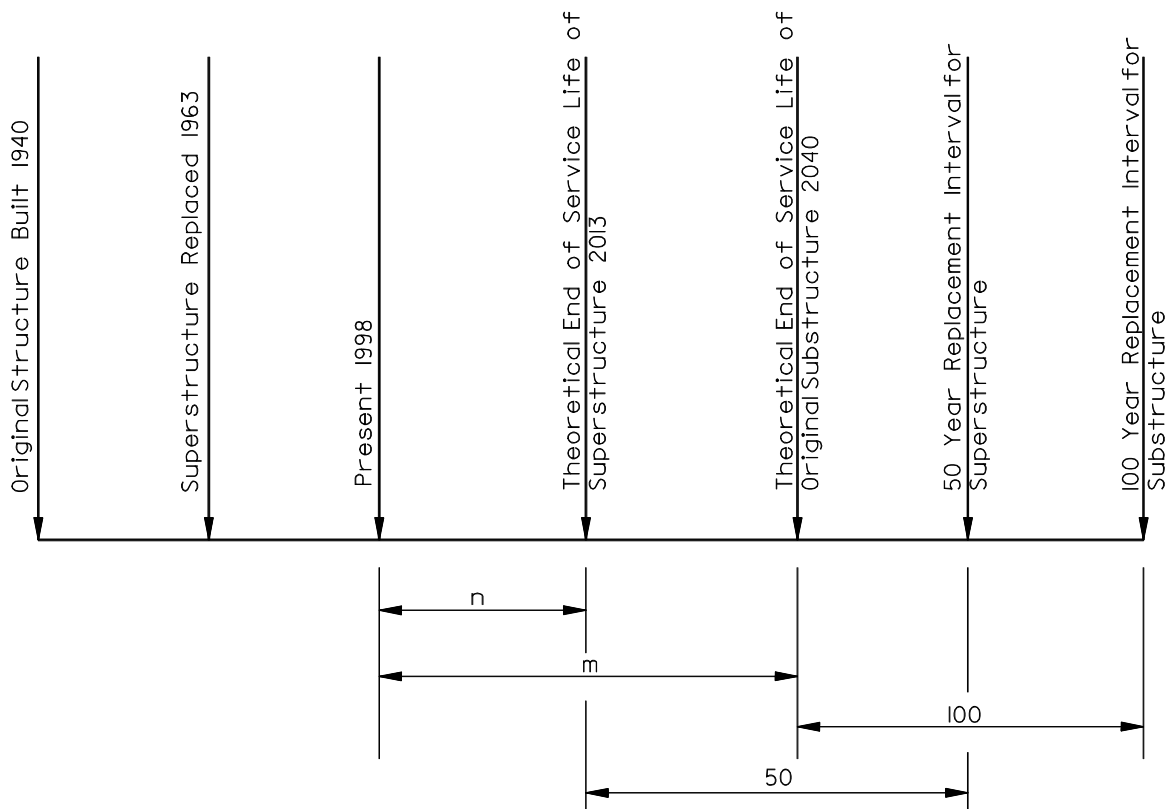
$x = \$52,003$ – Cost to replace the substructure

$y = \$56,956$ – Cost to replace superstructure

$m = 42$ years – Remaining life of substructure

$n = 15$ years – Remaining life of superstructure

$i = 6\%$ – Interest rate



Problem: A Railroad has indicated its interest in being relieved of its maintenance obligation for a highway-railroad grade-separation structure in return for a lump-sum payment to the Department in a sum equivalent to the capitalized cost for perpetuation of the structure.

Solution:

$$x \left[\frac{1}{(1+i)^m} \right] = 52,003(0.0865) = \$4498.26$$

$$y \left[\frac{1}{(1+i)^n} \right] = 56,956(0.4173) = \$23,767.74$$

$$\left[\frac{\left(x \left[\frac{i}{(1+i)^{100} - 1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^m} \right] = \left[\frac{(52,003[0.00018])}{0.06} \right] [0.0865] = \$13.49$$

$$\left[\frac{\left(y \left[\frac{i}{(1+i)^{50} - 1} \right] \right)}{i} \right] \left[\frac{1}{(1+i)^n} \right] = \left[\frac{(56,956[0.00344])}{0.06} \right] [0.4173] = \$1362.69$$

Capitalized Cost = \$29,642.18

Railroad share (50%) = 0.5 (29,642.18) = \$14,821.09

7-1.02(c) Grade Crossing Participation

The Department opposes any new at-grade crossing when such crossing involves a railroad line used for passenger train operations, regardless of the operator or frequency of the trains or the location of the crossing.

Where a new grade crossing of a freight rail line is established or an existing grade crossing will be reconstructed on a State highway as a result of a highway improvement project initiated by the Department, the Department will be responsible for 100% of the cost for constructing the crossing.

Where a new grade crossing is established or an existing grade crossing will be reconstructed on a State highway as a result of a railroad reconstruction, rehabilitation, or maintenance program initiated by the Railroad, the Railroad will be responsible for 100% of the cost of constructing or reconstructing the crossing.

When the Department determines that an existing grade crossing on a State highway is at the end of its service life and in need of reconstruction or when the Department determines that conditions warrant reconstruction, the Department may participate toward the cost of the new construction or reconstructing the crossing.

If an existing grade crossing on a State highway will be reconstructed or rehabilitated as a result of a project initiated by other than the Department or the Railroad and the Department has determined that the installation is necessary and in the best public interest, the Department may participate in the cost in proportion to the benefits to the motoring public.

Where all or any portion of the cost of new construction, reconstruction, or rehabilitation of a crossing will be provided by the Department, participation by the Department will be limited to the materials, labor, and equipment required to construct, reconstruct, or rehabilitate the crossing.

7-1.02(d) Grade Crossing and Warning Device Maintenance

The Railroad, or the track owner, is responsible for maintenance of the grade crossing and the warning devices, actuating devices, and circuitry.

7-1.02(e) Grade Crossing Warning Device Improvements

The Department requires the installation of appropriate warning signs and devices at all highway-railroad grade crossings. The Department's participation in the cost of these devices is contingent upon Department concurrence in the type of device required, the degree of sophistication necessary in the activating equipment, and the degree of contribution to highway capacity and safety.

Funding for all Department-initiated projects will be determined on a priority basis based on vehicular traffic, railroad traffic, highway classification, and the availability of funds.

The Department, the Railroad, or agencies other than the Department may propose changes in either the type of warning devices or in the method of actuation at existing crossings. Where the Department has determined that these changes will result in mutual benefits to all parties involved, the Department may participate in the costs in proportion to the benefits to the motoring public.

The Department will generally bear 100% of the cost of the improvements for the following conditions:

- Where the project includes the installation of warning devices at new grade crossings, the relocation of existing warning devices, or the installation of additional devices at existing crossings that are required as the result of highway improvement projects initiated by the Department.

- Where the Department has determined that the warning devices in place at an existing grade crossing are no longer adequate to provide for the safety of the motoring public and that additional or supplemental warning devices are deemed necessary.
- Where the Department has determined that a change is necessary in the method of actuation of automatic warning devices at existing crossings for the improvement of vehicular operations.

The Railroad will be responsible for 100% of the cost of the improvements where changes to an existing grade crossing or the construction of a new grade crossing are necessitated as the result of improvement or maintenance programs initiated by the Railroad or changes in rail operations (e.g., number of movements, speeds).

7-1.02(f) Grade Crossing Modification on a Permit Crossing

Where a railroad grade crossing has been created as the result of a permit issued by the Department, the Railroad or track owner shall take prompt action to adjust, reconstruct, or otherwise modify the crossing and/or warning devices as required by any highway improvements upon receiving a request from the Department. The Railroad or track owner will be responsible for 100% of the costs of such improvements. See *92 Illinois Administrative Code 530, Accommodation of Utilities on Right-of-Way of the Illinois State Highway System*.

7-1.03 Preliminary Engineering

7-1.03(a) General

In most instances, the Department prepares the plans for new construction, modernization, or reconstruction of highway structures, drainage facilities, and the approaches. Occasionally, the Railroad will prepare plans for a structure carrying the railroad over a highway.

All plans, specifications, and special provisions prepared by either the Department or the Railroad are subject to approval by the other party, and no changes will be allowed by either party without the consent in writing of the other party.

7-1.03(b) Reimbursement

Preliminary engineering performed by Railroad forces or by consultants employed either by the Railroad or by IDOT on highway-railroad grade separations is reimbursable with Federal or State funds.

7-1.03(c) Railroad Structures Designed By or For the Railroad

This section applies to a railroad structure over a State highway. When the Railroad elects not to perform the structure design with its own forces and the Department does not have the forces available to perform the design within the required schedule, a consultant may be employed to perform the design. Ordinarily, the Department will select a suitable consultant from a list of consultants approved by the Railroad. The design work is then performed by agreement between the Department and the consultant with the Railroad's approval.

In certain cases, where justified, the Railroad will select a consultant to design the structure and enter into an agreement with the consultant for the design. The selection of the consultant and the terms, including the fee, is subject to IDOT approval.

In those projects where Federal-aid funds are anticipated for reimbursing the Railroad's consultant for the cost of preparing the plans for a structure, the preliminary engineering cost must be programmed before IDOT can authorize the preparation of such plans.

7-1.03(d) Preliminary Engineering Portion of Railroad Force Account Work

The Railroad will generally perform the preliminary engineering with its own forces for the railroad force account work covered by construction agreements between the Department and the Railroad.

In special instances (particularly warning device system design), the Railroad may use the services of a consultant retained by the Railroad to perform the preliminary engineering.

7-1.03(e) Programming

When the method of treating a railroad crossing has been determined, it is essential that the district plan, initiate, and coordinate the programming and preliminary engineering portion of the proposed construction.

7-1.04 Commerce Commission Hearings**7-1.04(a) Commerce Commission Jurisdiction**

Rail carriers (Railroads) are corporations engaged in the transportation of passengers and/or goods for hire in the State of Illinois, as defined in the *Illinois Commercial Transportation Law* (625 ILCS 5/18c), and come under the jurisdiction of the Illinois Commerce Commission. The *Code* states, in part:

No public road, highway, or street shall hereafter be constructed across the track of any rail carrier at grade, nor shall the track of any rail carrier be constructed across a public road, highway, or street at grade, without having first secured the permission of the Commission;

The Commission's rules, regulations, and requirements cover the construction, maintenance, division of cost, marking, and signalizing of highway and railroad crossings in the State.

7-1.04(b) Procedure Before the Commission

The Preliminary Engineering Section will work with the Office of Chief Counsel to prepare petitions to the Commission requesting issuance of an Order relative to the crossing of a railroad by a proposed highway improvement when the improvement requiring the crossing was initiated by the Department.

If a hearing is required, the Department must be represented at the hearing to present the evidence through an expert witness who is familiar with the project.

After the case is heard by a duly authorized examiner of the Commission, an Order will be entered either denying or granting the request of the petitioner.

When a Railroad desires to establish a new crossing with a highway, it will file a petition with the Commission and present its case at a hearing which will be attended by representatives from the Office of Chief Counsel, the Preliminary Engineering Section, and the district involved when the Department is a respondent. This action is followed by the decision of the Commission as outlined in its Order. The Railroad must also acquire a permit from the district according to the Department's *Accommodation of Utilities on Right-of-Way of the Illinois State Highway System*.

7-1.05 Procedure for Removing Abandoned Railroad Structures and Grade Crossings

Many highway-railroad grade-separation structures, at-grade crossings, and related track materials of rail lines that have been abandoned remain in place on intersecting public highways. These structures constitute obstructions and encroachments on these highways and should be removed.

Before a Railroad company's right to operate on a particular line has been terminated (i.e., the rail line is abandoned), the Railroad company had authority from the Illinois Commerce Commission to obstruct the highway with the structure in question. After the right to operate is terminated, there remains no authority to obstruct the highway. Therefore, the Railroad company may be treated as any other person obstructing the highway.

The *Illinois Highway Code (605 ILCS 5/9-117)* establishes the procedure for identifying and removing obstructions from public highways. This procedure may be used if it is clear that the highway authority has absolutely no responsibility. Because sole responsibility by a Railroad is uncommon, it is unlikely that this procedure for removing obstructions will be used often. The Office of Chief Counsel may be consulted to help determine whether this procedure is appropriate in a particular situation.

The *Illinois Commercial Transportation Law (625 ILCS 5/18c-7401)* provides an additional statutory means for removing railroad structures from public highways. Under this law, the

Illinois Commerce Commission, after notice and hearing, has the authority to order the removal of abandoned tracks and overhead railroad structures crossing highways, waterways, or other railroads. The Commission may equitably apportion the costs between the parties. This may be based on the assignment of original construction costs and/or the present maintenance responsibility.

Therefore, after determining that the abandonment is final, as per notice from the Bureau of Railroads, and that the facility can be removed and after the district determines that the Railroad refuses or delays the removal, a request should be made to BDE for the removal. BDE will ensure the abandonment is final and request the Office of Chief Counsel to file a Petition for an Order requiring the removal of the facility. The district should be aware that the Commission may order the Department to bear part or all of the cost of removal.

If the Department determines that it should pay the entire cost of structure removal or that the structure presents an immediate danger to the traveling public, the Department may remove the structure without the permission of the Railroad, its successor in interest, or the Illinois Commerce Commission.

Remember that only the Railroad's right to operate is being abandoned. The Railroad may wish to sell its structures or may wish to use the structure at another location. If the Department agrees that the Railroad owns the structure on the highway right-of-way, the Railroad should be allowed to remove it. If the Department removes a structure owned by the Railroad or its assignee, the removed materials should be made available to the rightful owner.

7-1.06 Acquisition of Railroad Property

When the Department requires property interest from a Railroad to complete a highway improvement, sufficient lead time to acquire these interests is essential. It is critical that once it is determined that a project will require the acquisition of property owned or under the control of a Railroad that the Department's Land Acquisition personnel be informed.

7-1.06(a) Acquisition of Railroad Nonoperating Property

The acquisition of nonoperating Railroad property is accomplished according to the criteria outlined in the *Land Acquisition Policies and Procedures Manual*, and the *Federal-Aid Policy Guide*.

7-1.06(b) Acquisition of Railroad Operating Property

Where a proposed highway improvement will cross or longitudinally use a Railroad's operating property, the Department generally will acquire a permanent easement to construct and maintain the improvement. There will be instances when a highway project will require only the temporary use of Railroad property. When this situation occurs, permission to do work of a temporary nature on Railroad right-of-way will be included in the construction and maintenance

agreements between the Department and the Railroad. When there is no agreement, permission to do work of a temporary nature will be obtained by the district Land Acquisition staff.

Occasions where payment for such acquisition may be established and paid are as follows:

1. Land Owned in Fee. When a value is indicated and the Railroad company owning the fee title to its operating right-of-way can continue to operate its facilities either in, above, below, or adjacent to the highway, the Department of Transportation will compensate the Railroad for the right-of-way needed according to the Department's *Land Acquisition Policies and Procedures Manual*. No compensation of any kind will be provided for the acquisition of right-of-way to construct a grade-separation facility where an existing highway grade crossing is eliminated.
2. Land Owned as an Easement. If a Railroad has only an easement for its operating right-of-way and can continue to operate its facilities either in, above, below, or adjacent to the highway, there will be no compensation paid to cross or longitudinally use any part of the right-of-way.

The Railroad shall execute the necessary documents to cover the rights or interests required for the highway project according to the criteria in the *Land Acquisition Policies and Procedures Manual*, regardless of whether or not it owns the fee title or easement. The *Land Acquisition Policies and Procedures Manual* provides the procedure to be used if condemnation is necessary. However, note that permission of the Illinois Commerce Commission is a prerequisite to the filing of the complaint for condemnation and motion for the right of immediate possession and the time required must be considered when scheduling the project.

7-2 AGREEMENTS

7-2.01 General

The Preliminary Engineering Section within BDE is responsible for the preparation and negotiation of formal Agreements between the Department and the Railroad. This includes railroad grade separation projects, grade crossing projects, or projects involving the installation of State facilities (e.g., pipe culverts, storm sewers, underground electrical wiring on Railroad property) or any other work on Railroad property for improvements to the State highway system. The district should submit the necessary crossing data with sufficient lead time allowed for these negotiations. Typically, a year or more is required.

The Agreement will cover:

- division of work and expense involved between IDOT and the Railroad in connection with the crossing improvement;
- responsibilities for the future maintenance of the improvement;
- establishment of the Railroad's share of the cost as determined under the provisions of any one of the several classifications provided in the *Federal-Aid Policy Guide* and Section 7-1.02;
- reference to the acquisition of property rights, (see Section 7-1.06);
- reimbursement of the costs incurred by the Railroad according to the requirements of the *Federal-Aid Policy Guide*;
- coverage of liability during construction operations; and
- reference to or identification of plans and plan approval.

7-2.02 District Data

When Federal-aid funds are proposed, the district will be required to submit the necessary data for programming the project together with the necessary data for negotiations with the Railroad.

The district should submit a report to BDE containing reproducible drawings of the crossing plan prepared in sufficient detail showing the following:

1. Grade Separations. Include the following in the report:
 - existing conditions in the crossing area;
 - a plan and profile of the track or tracks and of the proposed highway improvement for 500 ft (150 m) in each direction from the intersection of the highway and railroad centerlines;

- typical highway and track cross sections;
 - railroad and highway right-of-way limits;
 - distance to a railroad reference marker (i.e., mile post);
 - railroad communication lines including the location of poles and height of wires;
 - existing and proposed drainage ditches, structures, and the direction of flow affecting the railroad;
 - construction details of existing and/or proposed grade crossings in the vicinity; note the type and location of warning devices;
 - details of any track adjustments or runaround tracks proposed, including staging;
 - details for detour road crossings and proposed temporary warning devices, including a plat and description of temporary easement if required;
 - number and speeds of passenger and freight trains using the track or tracks daily;
 - plat and description of the temporary easement as required by Section 7-3.03 for the possible location of the contractor's temporary grade crossing; and
 - all other data pertinent to the project.
2. Grade Crossings. For this report, full-size plan sheets will not be required. Include the following in the report:
- a. Existing Grade Crossing. At existing grade crossings, provide the following:
- number of mainline and subsidiary tracks;
 - type, width, and condition of the existing crossing(s);
 - type and locations of the existing warning devices at the crossing;
 - number and speeds of passenger and freight trains using the crossing daily; and
 - current and ten-year ADT of the highway.
- b. Proposed Grade Crossing. For new grade crossings, provide the following:
- number of tracks;
 - type and width of crossing(s);
 - types and locations of the proposed warning devices;

- anticipated date of construction; and
 - any unusual conditions bearing on the proposed work.
- c. Alternative Methods of Accommodating Traffic. For most projects, include a recommended method for accommodating traffic in the report. Methods are discussed in Chapter 13 and Departmental Policy TRA-3, "Reconstruction and Repair of Railroad Grade Crossings."

7-2.03 Negotiation Procedure

The Railroad Agreement is normally prepared by the Preliminary Engineering Section, Agreements Unit, and sent to the Railroad for review. A copy is also furnished to the district for its review.

When the Railroad receives the Agreement, the Railroad will begin preparation of the plans and cost estimates for the railroad force account work involved. Upon completion, the Railroad will submit the plans and cost estimates to the Department for review.

After the plans and cost estimates have been approved by the Department and the Agreement has been executed by the Railroad, the Agreement is returned to BDE for execution by the Department.

Upon full execution of the Agreement by the Railroad and the Department, one original copy is retained for the BDE file and the Agreement Unit distributes copies of the Agreement to the following:

- Railroad (1 original copy);
- Illinois Commerce Commission (1 copy);
- district (1 copy);
- Bureau of Accounting and Auditing (1 copy at the time the contract obligation document is established); and
- Project Control (1 copy).

7-2.04 Authorization Procedure

When a contract is awarded for a highway improvement which includes work in the area of a highway-railroad grade crossing, and when the affected Railroad is required to adjust its facilities as a part of the improvement, construction delays may be encountered. Generally, the Railroad is authorized to assemble its materials and perform its construction work at the time the contract has been scheduled for letting or at the time the contract is awarded. Because time is required by the Railroad to order materials and schedule work crews, it is not uncommon for

the highway contractor to be unable to proceed with its work in the area of the crossing. Although the delay may not create problems for the highway contractor or for the Department, it does represent a hardship to the motoring public.

To avoid delays and to facilitate construction, the district is allowed to review each project individually to determine if the contractor's operations will be facilitated by authorizing the Railroad to proceed prior to the letting advertisement or award of the highway contract. The district will authorize the Railroad to proceed with the force account work according to the executed railroad Agreement. The authorization should be issued to the same Railroad official to which BDE sent the executed Agreement.

Before an early authorization is given, a most probable highway letting date should have been established so that any necessary coordination between the Railroad and the contractor can be undertaken. Proper timing can also reduce any interim roadway maintenance.

If Federal-aid funds are used, the crossing work also must be programmed and authorized before the advance Railroad work is authorized. The district must request and obtain approval for early authorization from BDE's Project Development/Implementation Section, Program Support Unit and send a copy of the district authorization letter to the Railroad to BDE.

BDE will authorize the railroad work for individual safety crossings not related to highway contracts.

7-2.05 Adjustment Procedures

7-2.05(a) Change Orders

If a plan or estimate change becomes necessary after the Agreement has been executed, the district initiates the change. Extensively review all change orders or amendments to Agreements. Fully explain any deviations between the actual cost or the revised estimate and the original estimate. Submit supporting documentation (e.g., reason for change, copies of revised estimate, statements of actual cost) with the request for the change order or amendment to the Agreement. Changes will not be deemed accepted until approved by BDE.

If the scope, nature, and/or cost of the adjustment has changed significantly, an amendment to the Agreement may be necessary. If it is deemed that such an amendment is needed, submit an Agreement report for the amendment to BDE for processing. See Section 7-2.02.

For minor modifications in scope, nature, and/or cost, the district should complete Form BDE 804 and set forth the following information:

- the extent of the change,
- an estimate of the additional costs,
- the justification for the change, and
- a request for authorization of the change.

Forward Form BDE 804 to BDE for processing. Notification of the change is received through BDE.

Form BDE 804, Request for Authorization for Costs Involving Utility, Railroad, or Local Agency Agreement, may be accessed through the IDOT internet.

7-2.05(b) Final Billing

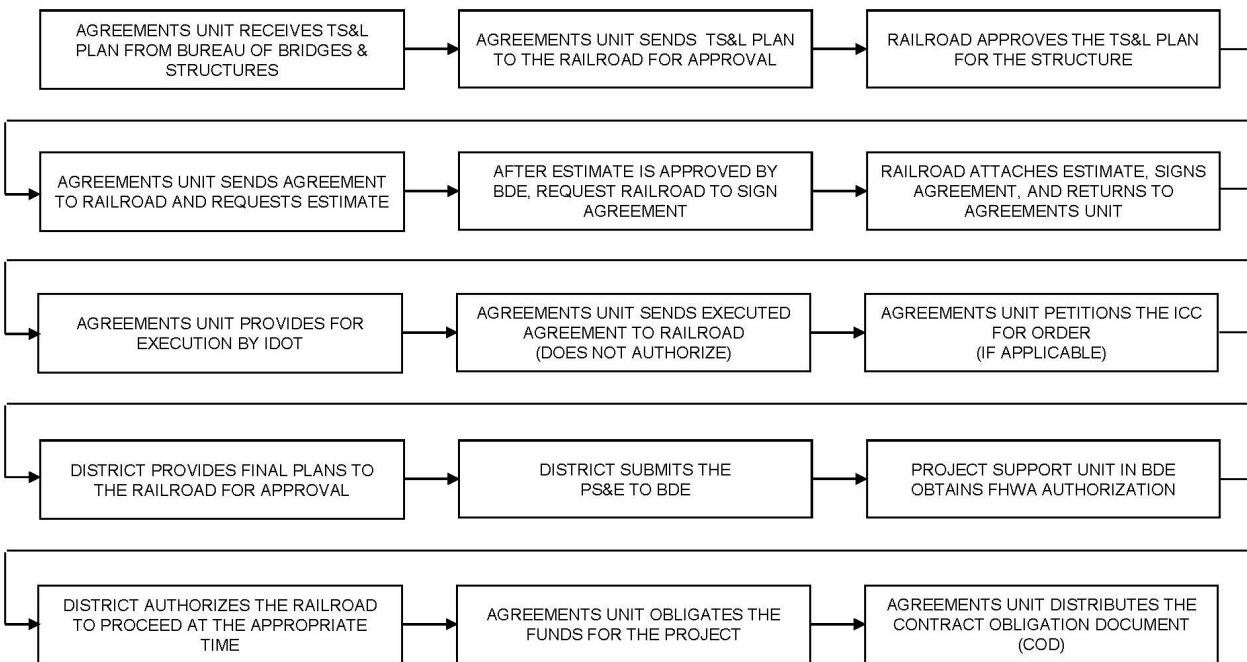
The following applies to processing the final bill for railroad adjustments:

1. Preparation of Final Billing. Ensure that the final bill complies with all requirements of the *Federal-Aid Policy Guide*, Part 140, Subpart I.
2. Review of Final Billing. The district will review the final bill to determine whether or not the final bill reflects the labor, equipment, and materials used in the adjustment.
3. Submission of Final Billing. Submit final bills and recommendations to the Bureau of Accounting and Auditing for audit.
4. Billing Discrepancies. If the final cost as approved by audit exceeds the estimated amount of the adjustment and Form BDE 804 was not submitted in the interim, explain the increase and submit appropriate recommendations on Form BDE 804.

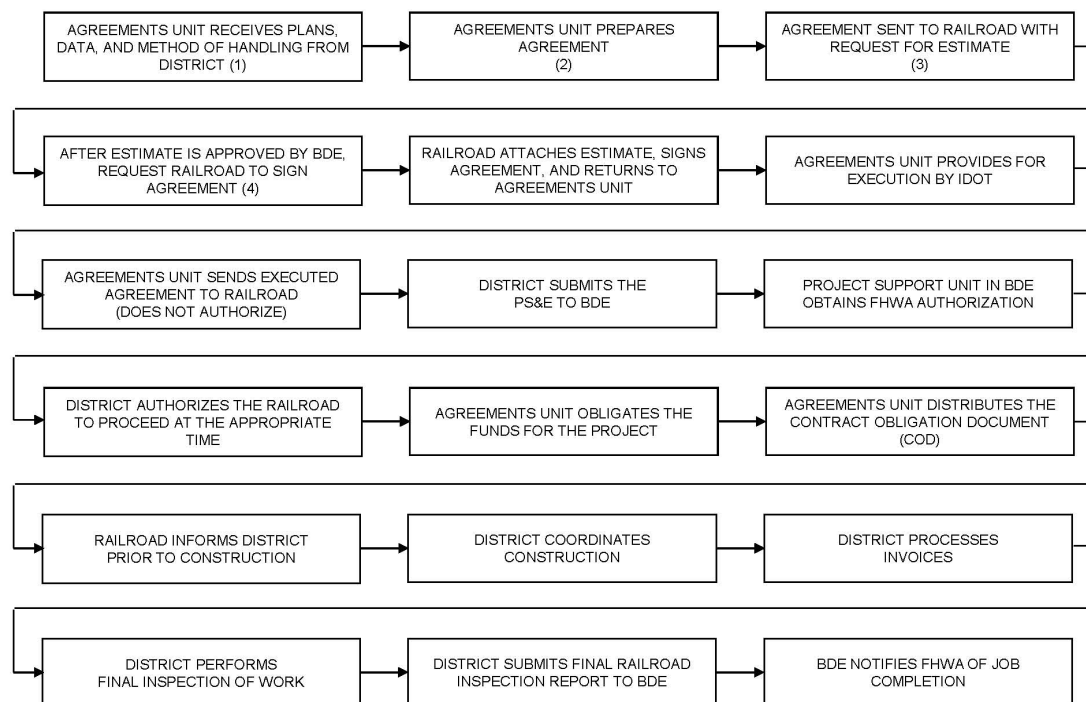
7-2.06 Railroad Agreement Process

Figures 7-2.A, 7-2.B, and 7-2.C illustrate flowcharts for the agreement negotiation processes for the following projects:

- Figure 7-2.A — grade separation structure projects,
- Figure 7-2.B — grade crossings/non-safety projects, and
- Figure 7-2.C — grade crossings/safety projects.



**RAILROAD AGREEMENT PROCESS
(Grade Separation Structure Projects)
Figure 7-2.A**



(1) District submittal should indicate whether an interconnection is needed, including any timing requirements for the railroad control circuitry. Interconnection plans and requirements will be approved by the Central Bureau of Operations prior to submittal to the Railroad.

(2) When signal improvements are involved, the typical agreement states the following:

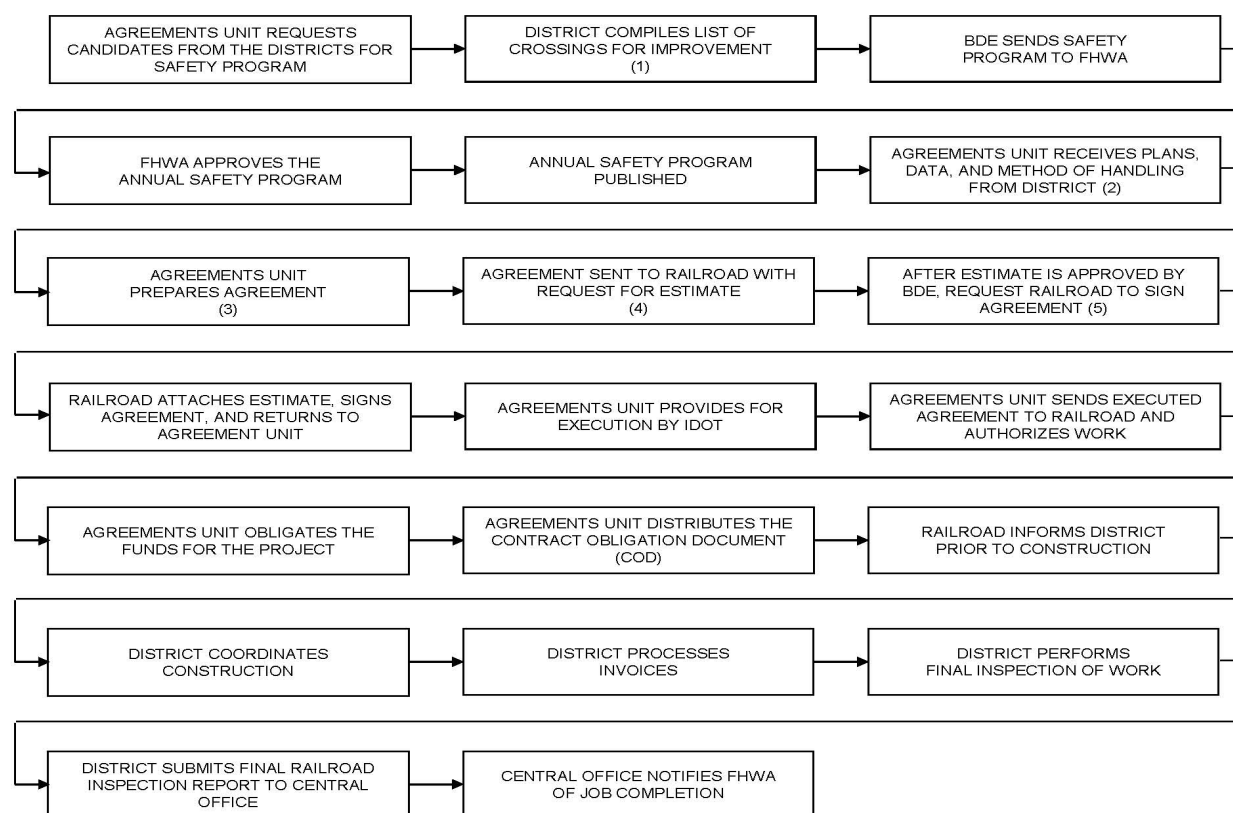
The COMPANY will petition the Illinois Commerce Commission in accordance with 92 Illinois Administrative Code 1535 to take jurisdiction in this matter and to enter such orders as may be necessary.

(3) The transmittal to the Railroad should indicate any interconnection requirements.

(4) The Railroad's interconnection plans will be approved by the Central Bureau of Operations prior to the approval of the estimate.

RAILROAD AGREEMENT PROCESS (Grade Crossing/Non-Safety Projects)

Figure 7-2.B



- (1) List based on annual inspections, expected crashes, and complaints.
- (2) District submittal should indicate whether an interconnection is needed, including any timing requirements for the railroad control circuitry. Interconnection plans and requirements will be approved by the Central Bureau of Operations prior to submittal to the Railroad.
- (3) When signal improvements are involved, the typical agreement states the following:
The COMPANY will petition the Illinois Commerce Commission in accordance with 92 Illinois Administrative Code 1535 to take jurisdiction in this matter and to enter such orders as may be necessary.
- (4) The transmittal to the Railroad should indicate any interconnection and requirements.
- (5) The Railroad's interconnection plans will be approved by the Central Bureau of Operations prior to the approval of the estimate.

RAILROAD AGREEMENT PROCESS (Grade Crossing/Safety Projects)

Figure 7-2.C

7-3 DESIGN FUNCTIONS

7-3.01 General

As State highways and railroads are expanded or modernized, it is inevitable that new highway-railroad crossings will need to be established and that existing crossings will need to be modernized, reconstructed, or eliminated. Basically, there are two methods of accomplishing these crossings:

1. At-Grade Crossing. This method is where the highway and railroad intersect at the same elevation requiring proper warning to reduce the inherent hazard of collisions between trains and highway vehicles.
2. Grade Separation Crossing. This method is where the inherent collision hazard is eliminated by the construction of a structure that carries the highway over or under the railroad.

7-3.02 At-Grade Crossings

7-3.02(a) Selection Guidelines for Warning Devices

Warning devices will be warranted at all highway-railroad crossings where grades are not separated. Select the type of warning device according to the following:

1. General. At a minimum, provide reflectorized crossbucks, pavement markings, and advance warning signs as indicated in the *Illinois Manual on Uniform Traffic Control Devices* at all crossings.
2. Flashing Signals. Install flashing signals at crossings where the warrants for gates are not met and where the expected crash frequency equals or exceeds 0.02. Use Equation 7-3.1 and the factors in Figure 7-3.A to determine the expected crash frequency.

$$ECF = A \times B \times T$$

Equation 7-3.1

Where:

ECF	=	Expected Crash Frequency
A	=	Traffic factor, see Figure 7-3.A
B	=	Component factor, see Figure 7-3.A
T	=	Current number of trains per day

3. Cantilevered Flashing Signals. Use cantilevered flashing signals, in addition to other warning devices, on multilane highways that qualify for active warning devices and where there is the possibility of a truck blocking the view of the roadside signals. Also, consider providing cantilever signals at high-frequency crash locations that possibly could be improved by more visible signals.

A Factors

VEHICLES PER DAY (10-YR. ADT)	FACTOR
250	0.000347
500	0.000694
1000	0.001377
2000	0.002627
3000	0.003981
4000	0.005208
5000	0.006516
6000	0.007720
7000	0.009005
8000	0.010278
9000	0.011435
10000	0.012674
12000	0.015012
14000	0.017315
16000	0.019549
18000	0.021736
20000	0.023877
25000	0.029051
30000	0.034757

B Factors — Basic Values for Existing Devices

Components	Basic Value Adjustments
Crossbucks, traffic volume less than 500 vehicles per day	3.89
Crossbucks, urban	3.06
Crossbucks, rural	3.08
Stop signs, traffic volume less than 500 vehicles per day	4.51
Stop signs	1.15
Wigwags	0.61
Flashing lights, urban	0.23
Flashing lights, rural	0.93
Gates, urban	0.08
Gates, rural	0.19

CRASH FREQUENCY FACTORS
(Highway-Railroad Grade Crossings)

Figure 7-3.A

4. Gates and Flashing Signals. Provide flashing signals and gates where one or more of the following conditions are met:

- multiple mainline railroad tracks;
- multiple tracks at or in the vicinity of the crossing which may be occupied by a train or locomotive, so as to obscure from view the movement of another train approaching the crossing;
- high-speed train operation combined with limited sight distance at either single or multiple track crossings;
- a combination of high speeds and moderately high volumes of highway and railroad traffic;
- either a high volume of vehicular traffic, high number of train movements, substantial numbers of school buses or trucks carrying hazardous materials, unusually restricted sight distance, continuing crash occurrences, or any combination of these conditions;
- the expected crash frequency for flashing lights exceeds 0.02 and the benefit-cost ratio equals or exceeds 1.0 (the method for determining the benefit-cost ratio is shown in Figure 7-3.B); and/or
- a diagnostic team recommends them.

In individual cases where a diagnostic team justifies that gates are not appropriate, gates will not be required.

5. High-Type Device. Provide a higher type of warning device which may not be justified under any of the preceding warrants based on continuing or potential crash occurrence due to:

- unusual track or roadway geometrics;
- restricted sight distance; and/or
- other unusual conditions, such as where there exist exceptional crash consequences to a large number of people as rail or highway passengers or as the result of a crash involving hazardous materials.

In other instances, a lower level device may be justified if concurred with by a diagnostic team.

Definitions: ECF = Expected Crash Frequency = $A \times B \times T$ Equation 7-3.1

Z = Cost of crash = ratio of deaths and injuries per crash (average for latest 3 years in Illinois) x cost per crash (National Safety Council crash cost data which is documented and periodically updated by BDE)

U = Cost of flashing lights divided by expected life = _____

V = Yearly maintenance cost of flashing lights = _____

Y = Cost of gates divided by expected life = _____

W = Additional annual cost to maintain = _____
gates instead of flashing lights

L = Cost of grade separation divided by expected life = _____

M = Additional annual cost to maintain grade = _____
separation instead of gates

(Expected life can be assumed as 20 to 30 years.)

Step 1: ECF for present installation = $A \times B \times T$ = _____

Step 2: ECF for proposed installation = $A \times B \times T$ = _____

Step 3: Savings in ECF per year = Step 1 - Step 2 = _____

Step 4: Benefit = $Z \times \text{Step 3}$ = \$ _____

Step 5: Cost of proposed installation = $Y + W$, or $U + V$, or $L + M$ = \$ _____

Step 6: Benefit-Cost Ratio = Step 4 divided by Step 5 = _____

BENEFIT-COST RATIO ANALYSIS
(Highway-Railroad Crossings)

Figure 7-3.B

Where the distance measured along the centerline of the highway between two regularly used adjacent tracks is less than 100 ft (30 m), consider the crossing as a multiple track crossing and install warning devices accordingly. Where the distance is 100 ft (30 m) or more, consider each crossing as individual crossings and signalize each according to the preceding warrants.

7-3.02(b) Example for Warning Device Selection

* * * * *

Example 7-3.1

Given: Urban Area
Crossbuck Protection
10-year ADT = 5000 Vehicles Per Day
Current Train Traffic = 5 Trains Per Day

Problem: Determine the appropriate warning devices that should be used at this crossing.

Solution: First determine the expected crash frequency of the existing crossbuck protection.

Expected Crash Frequency:

$$ECF = 0.006516 \times 3.06 \times 5$$

$$ECF = 0.10$$

$$ECF = 1 \text{ crash every ten years}$$

Crash frequency is greater than 0.02 indicating the need for higher type device.

Try flashing lights:

$$"B" = 0.23$$

$$ECF = 0.006516 \times 0.23 \times 5$$

$$ECF = 0.01$$

Therefore, flashing lights are warranted.

* * * * *

7-3.02(c) Circuitry Devices

Refinements to activation circuitry should be recommended where the credibility of the warning devices could be beneficially increased. This includes shortening the signal "starts" to reflect reduced train speeds, or installing motion detectors or constant warning time devices (predictors). Consider the following:

1. Grade Crossing Predictors. Install grade crossing predictors (GCP/constant warning time) circuitry at crossings with ADT of at least 1000 vehicles and an average daily train traffic of at least 5 trains per day, or where there are concentrations of train or vehicular traffic during “rush hours” and where:
 - there are switching moves on the approach circuits,
 - at least 25% of the average daily trains operate at 25 mph (40 km/h) slower than the fastest train on the line, or
 - there is an unusual track and crossing geometry.
2. Motion Detectors.
 - a. Gates. Where gates are present, provide motion detectors where there:
 - is stopping or other lengthy occupancy of the approach circuits,
 - are new gate installations,
 - is upgrading of crossings with flashing signals to gate installations, or
 - are major control circuitry changes required at existing installations.
 - b. Flashing Signals. For flashing signals, provide motion detectors where there:
 - is stopping or other lengthy occupancy of the approach circuits,
 - are new flashing signal installations with ADT of 1000 vehicles or more and 5 or more trains per day, or
 - are major control circuit changes required by changes in or additions to flashing signals at crossings with ADT of 1000 vehicles or more and 5 or more trains per day.

Note that the cost differential between grade crossing predictors (GCP/constant warning time) and motion detector circuitry is minor in comparison to the total installation cost. In addition, grade crossing predictor (GCP/constant warning time) circuitry can be adjusted to a wider, more variable set of train traffic conditions. When contemplating circuitry improvements, it is best to contact the Railroad to make an accurate assessment of train traffic and a more informed decision on circuitry improvements.

7-3.02(d) Barrier Systems

The following will apply to barrier systems around warning devices:

1. General. Do not provide barrier systems (e.g., guardrail, impact attenuators) at railroad grade crossings except in extraordinary circumstances. In most cases, the roadside

barrier presents more of a hazard than the railroad warning device it shields. Also, it may block a lateral escape route in advance of the signal. Extraordinary circumstances which may justify the use of a roadside barrier in the vicinity of a railroad crossing warning device include:

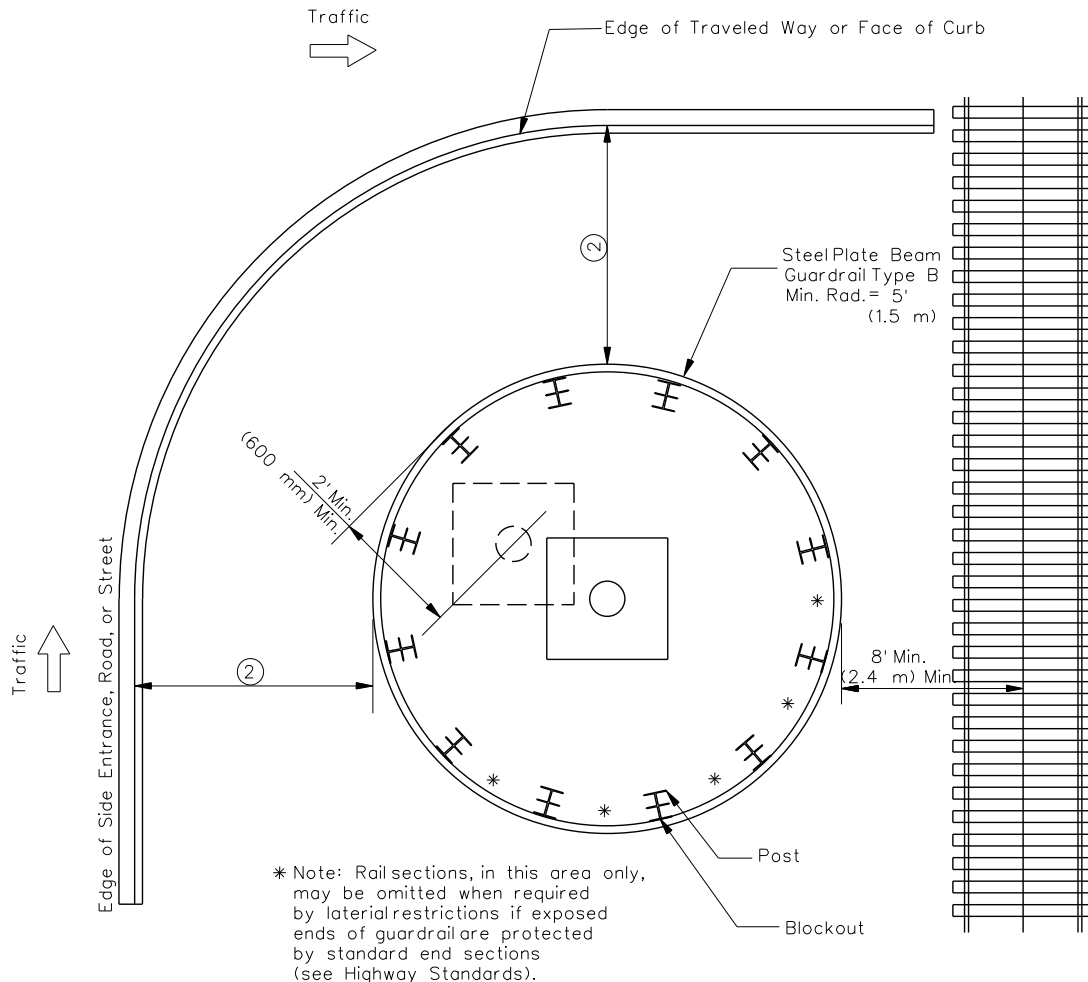
- locations where the approach roadway is on a fill with side slopes steeper than 1V:3H and greater than 10 ft (3.0 m) in height,
 - locations with a high-crash history involving warning device where a cost-effective analysis demonstrates a roadside barrier is warranted, and
 - locations where there will be a temporary delay in moving warning devices for widening of a highway.
2. Installation. See Chapter 38 and the *Highway Standards* for the installation of guardrail at crossings.
 3. Special Conditions. In industrial or other areas involving low-speed highway traffic and where warning devices are vulnerable to damage by turning truck traffic, ring-type guardrail may be installed to provide protection for warning devices. Ring-type guardrail should conform to Figures 7-3.C and 7-3.D. Substitute shielding devices (e.g., concrete, railroad ties, railroad rails) are not permitted.
 4. Signals. Do not use breakaway or frangible bases for cantilever signal supports.
 5. Maintenance of Barriers. The Department will maintain all longitudinal guardrail and impact attenuators. The Railroad will be responsible for maintaining the ring-type guardrail.
 6. Approval. Approval for the erection of any roadside barrier by the Railroad must be obtained in writing from BDE.

7-3.02(e) Approaches

When a grade crossing improvement is undertaken, that portion of the roadway lying within or adjacent to the crossing should, if necessary, be improved to provide a smooth approach to the crossing so that the driver's attention will not be diverted from warning devices or oncoming trains by rough approaches. Also, consider removing or relocating any obstructions to a motorist's view of warning devices within the roadway. This includes utility poles, shrubs, trees, signs, etc.

7-3.02(f) Design Considerations

When it has been determined that an at-grade crossing is appropriate at a highway-railroad intersection, the district will prepare a plan and profile sheet for the highway showing complete

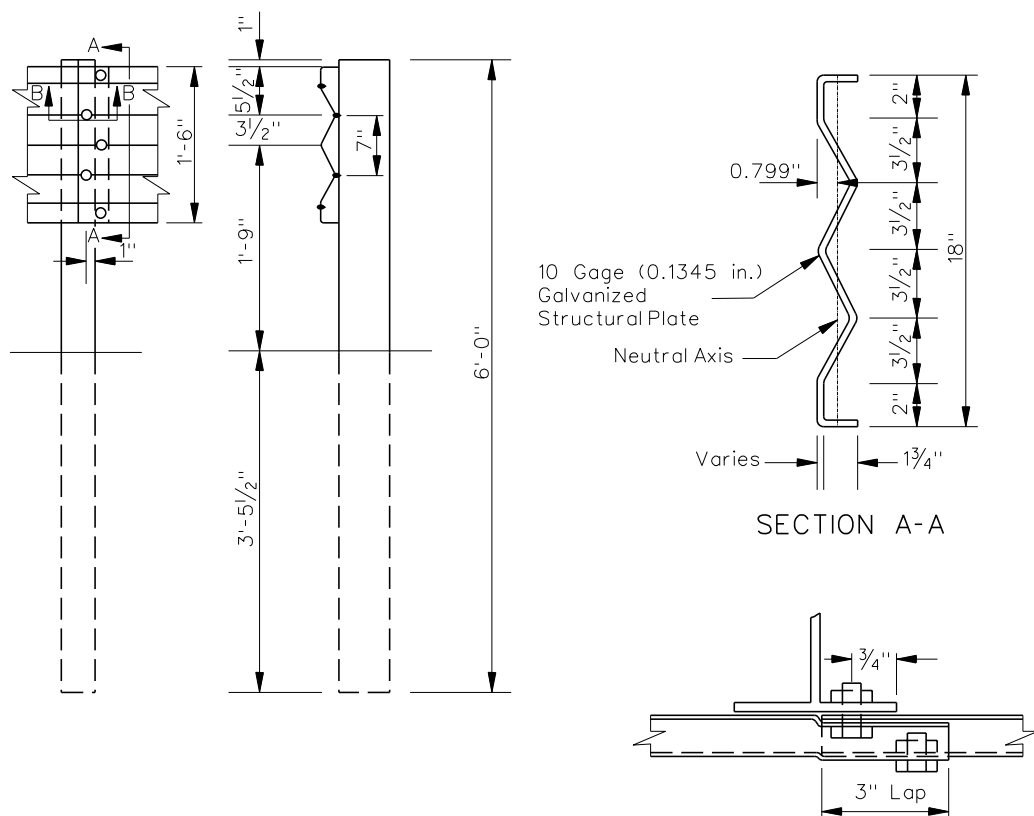


NOTES:

1. All construction and material should conform to the latest editions of the IDOT *Highway Standards* and IDOT *Standard Specifications*.
2. Minimum offset determined by general conditions with 6 ft (1.8 m) and 2 ft (600 mm) desirable for rural and urban sections respectively. Offset the guardrail a minimum of 6 ft (1.8 m) where the roadway cross sections include flush shoulders. In no case shall guardrail encroach upon the shoulder.
3. Guard ring may be off center of warning device when required by lateral restrictions.
4. If either the size or the number of warning device foundations will preclude the use of a circular ring as shown, an appropriate amount of tangent guardrail may be included.
5. If, due to geometrics of the warning device location, it is not practical to provide a 5-ft (1.5-m) minimum radius guard ring, with minimum clearance, the alternative structural plate ring should be considered; see Figure 7-3.D.

RAILROAD WARNING DEVICE GUARDRAIL
(For Roadways Up to 45 mph (70 km/h))

Figure 7-3.C



General Notes:

1. All bolts have a 5/8" diameter and length as required.
2. Galvanize all bolts and nuts according to the requirements of AASHTO M232.
3. All holes in posts are 3/4" diameter.
4. The rail elements should conform to the material requirements and be galvanized according to AASHTO M180.
5. Structural Plate Guard Ring and posts will conform to the applicable portions of the IDOT Standard Specifications and Highway Standards.
6. The inch-pound units have been retained for use by Railroads.

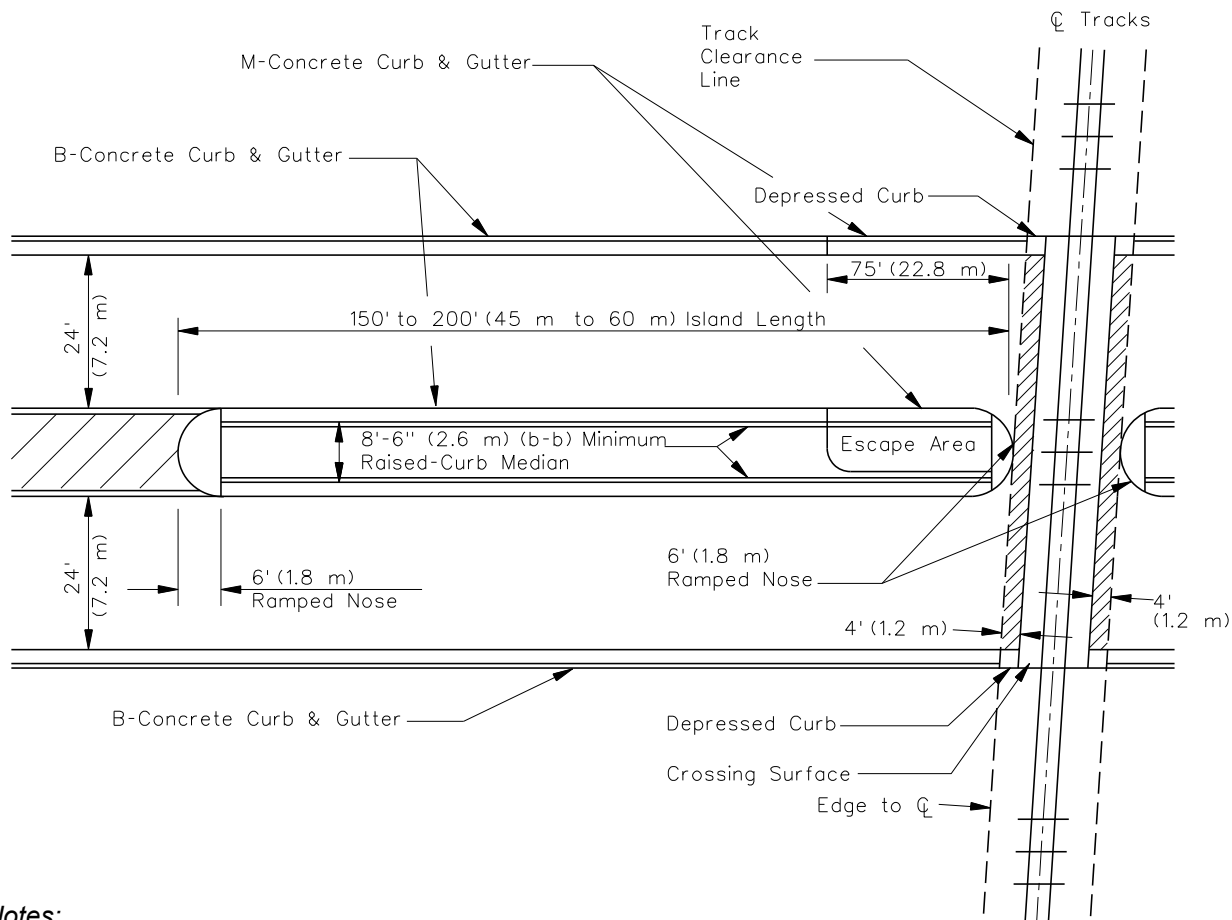
ALTERNATIVE STRUCTURAL PLATE GUARD RING
(For Radius, 5 ft (1.5 m))
Figure 7-3.D

information for existing and proposed railroad facilities; see Section 7-2.02. These plans will be used by BDE for negotiating with the Railroad involved. When designing grade crossings, consider the following:

1. Grade Crossing Proper.

- a. Surface Material. Where the roadway traffic equals or exceeds 1000 ADT, use prefabricated rubber or concrete surface materials. For ADT less than 1000, timber and/or asphalt crossings may be used.
- b. Medians. Where median-mounted warning devices will be installed and other than an earth median is adjacent to a grade crossing, the median should have a minimum median width of 8.5 ft (2.6 m) (10 ft (3.0 m) desirable) back-to-back of curb. Depress all medians and curbs on approaches to the crossing to the level of the pavement edge or gutter flag within the track clearance line which is parallel to and 8 ft (2.4 m) from the centerline of the nearest track; see Figure 7-3.E.
- c. Location. Where no barrier curbs extend along the pavement, the crossing proper and islands between tracks should extend to parallel lines which are 8 ft (2.4 m) outside of the pavement edges or to edge of stabilized shoulder, whichever is greater. Where barrier curbs along the pavement are present, the crossing proper and islands should extend to the back of the curb except where the opening along the curb exceeds 55 ft (16.8 m), in which case the crossing should extend 3 ft (900 mm) outside the curb face.
- d. Sidewalks. Where sidewalks are present, also include a sidewalk crossing. Where sidewalks abut or are in close proximity to the back of curb, the district may elect to extend the prefabricated crossing materials to the outer limits of the sidewalk.
- e. Pavement. Construct the approaches to grade crossings and the islands between the tracks according to the *IDOT Highway Standards*. This also applies where a Railroad constructs a crossing through an existing pavement.
- f. Grades. Design the grades on approaches to grade crossings, as a minimum, according to the criteria in the *92 Illinois Administrative Code*, Chapter III, Subchapter C, Section 1535.204.

2. Grade Crossing Warning Devices. Ensure the design, installation, and operation of grade crossing warning devices conforms to the *Illinois Manual on Uniform Traffic Control Devices (ILMUTCD)* and *92 Illinois Administrative Code*, Chapter III, Subchapter C, Part 1535 as applicable.



Notes:

1. Where a raised-curb, flush, or traversable type median is used on the roadway, provide B-6 or B-9 (B-15 or B-22) raised-curb median on crossing approaches and provide M-2 or M-4 (M-5 or M-10) raised-curb median on crossing departures adjacent to each side of the railroad track(s); see Section 34-2.04.
2. In addition to deterring vehicular movements over the track(s) in the median area, the raised-curb median provides a space for mounting railroad warning device units, if required. Also, see Section 36-8.
3. If the railroad tracks are located close to a cross street and lie within the left-turn lane of the intersection, this situation will require a special design and the use of barrier type curb along the median adjacent to the turn lane.
4. The median should have a minimum width of 8.5 ft (2.6 m) (10 ft (3.0 m) desirable) back-to-back of curb.

**TYPICAL MID-BLOCK MEDIAN TREATMENT ADJACENT TO RAILROAD CROSSINGS
(Multilane Urban and Suburban Highways)**

Figure 7-3.E

Locate warning device units a minimum of 12 ft (3.6 m) from the centerline of near track and 4 ft 3 in (1.3 m) back of the face of curb or outside the edge of paved shoulder or 8 ft 3 in (2.5 m) outside the edge of traveled way. The 4 ft 3 in (1.3 m) and 8 ft 3 in (2.5 m) dimensions allow the clearances noted in the *ILMUTCD* in the event the railroad installs lamp units equipped with large backgrounds.

3. Sight Distance. The AASHTO *A Policy on Geometric Design of Highways and Streets* presents criteria to determine the applicable sight triangle at a highway-railroad crossing.

7-3.02(g) Signalized Intersections

Where a signalized highway intersection is located near a railroad grade crossing, ensure that there is sufficient storage distance between the highway intersection and railroad grade crossing to allow for the storage of stopped vehicles at the intersection. Where this is not practical, coordinate the traffic signal system with the railroad's approach circuitry to allow stopped traffic on or near the grade crossing to clear the crossing upon the approach of a train. Where the railroad crossing is signalized, interconnect the two signal systems. For guidance on the design and coordination of traffic signals near grade crossings, review the *ILMUTCD*, the ITE publication *Preemption of Traffic Signals At or Near Railroad Grade Crossings with Active Warning Devices*, Section 36-8, and Chapter 57.

All grade crossings requiring an interconnection must be coordinated with the Bureau of Operations. See the flowcharts in Figures 7-2.A, 7-2.B, and 7-2.C for a general outline of the coordination process.

7-3.03 Grade-Separated Structures

7-3.03(a) Warrants

A grade separation should be provided where a highway is constructed or reconstructed across a railroad when the crash frequency for gates exceeds 0.02 and the benefit-cost ratio equals or exceeds 1.0.

A grade separation should be provided where an expressway in a rural area is constructed or reconstructed across the railroad.

7-3.03(b) Design Considerations

Where grade separation is warranted as determined by the criteria contained in Section 7-3.03(a), BDE will be responsible for the negotiations with the railroad involved to determine who will design the structure; see Section 7-2. Plans prepared by or for the Department must be approved by the Railroad and should show:

- the structural design features;
- the vertical clearance from top of rail to under clearance of superstructure;
- the distance between track centers for multiple-track crossing;
- the lateral clearance from track center to face of adjacent pier (or abutment);
- the distance to a designated railroad reference marker (i.e., mile post) from centerline of bridge;
- the flow line and cross section of existing and proposed drainage features, including drainage structures;
- the location and stationing of railroad right-of-way lines;
- the wire lines and utility facilities located on railroad right-of-way; and
- other pertinent features affecting the Railroad's interests.

For details of the geometric design, see the *Bureau of Bridges and Structures Manual*.

Section 7-1.06 addresses acquisition of the necessary railroad property for the structure. The contractor shall be responsible for temporary railroad crossings for use by the Contractor in accordance with Article 107.10 of the *Standard Specifications*.

7-3.04 Other Agency References

For uniformity, use the applicable Federal regulations on both Federally and non-Federally funded projects. Clearance and public safety aspects of all projects shall conform with the regulations of the Illinois Commerce Commission. Applicable publications of these agencies are provided in Figure 7-3.F.

PUBLICATION	SUBJECT
*FPG, Chapter 1, Subchapter B, Part 140, Subpart I	Reimbursement for Railroad Work
*FPG, Chapter 1, Subchapter G, Part 646, Subpart B	Railroad-Highway Projects
*FPG, Chapter 1, Subchapter G, Part 646, Subpart A	Railroad-Highway Insurance Protection
92 <i>Illinois Administrative Code</i> , Chapter III, Subchapter C, Part 1500	Minimum Clearances Applicable to Tracks, Structures, Fixtures, and Other Appurtenances of Railroads
92 <i>Illinois Administrative Code</i> , Chapter III, Subchapter C, Part 1535	Crossings of Rail Carriers and Highways
<i>Illinois Supplement to the Manual on Uniform Traffic Control Devices</i>	

*FPG = FHWA Federal-Aid Policy Guide.

PERTINENT PUBLICATIONS OF OTHER AGENCIES

Figure 7-3.F